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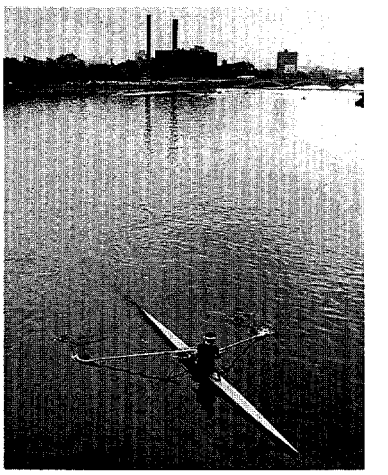
Report of the Southeastern New England Study



a Strategy for Balanced Development and Protection of Water and Related Land Resources in Eastern Massachusetts and Rhode Island

1. IPSWICH-NORTH SHORE PLANNING AREA REPORT

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New England River Basins Commission

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New England River Basins Comm.

The Southeastern New England Study (SENE) is a "level B water and related land resources study." It was conducted under the provisions of the federal Water Resources Planning Act of 1965. The resources management program the Study produced was developed by a team of federal, state, and regional officials, local citizens, and the scientific community, under the overall coordination of the New England River Basins Commission. It is a part of the Commission's comprehensive, coordinated joint plan for the water and related land resources of New England.

The recommended program for managing the resources of Southeastern New England is described, in increasing level of detail, in the following Final Reports:

A SUMMARY highlighting the principal findings and recommendations of the Study, and their implications for the future of the region.

A REGIONAL REPORT and Environmental Impact Statement describing *in detail* the natural resources, issues and problems facing the region, the alternative solutions examined during the Study, the recommendations made, and their implications. It includes policies and programs for dealing with water supply, land use, water quality, outdoor recreation, marine resources, flood and erosion protection, and key facilities siting, and the changes in state and local government required to implement the program.

Ten PLANNING AREA REPORTS dealing with the same subjects as the Regional Report, but aimed at the local level. Eastern Massachusetts and Rhode Island were divided into ten "planning areas" based either on traditional sub-state divisions or principal river basins. Reports were prepared for the following areas:

1. **Ipswich-North Shore,**
2. **Boston Metropolitan,**
3. **South Shore,**
4. **Cape Cod and the Islands,**
5. **Buzzards Bay,**
6. **Taunton,**
7. **Blackstone and Vicinity,**
8. **Pawtuxet,**
9. **Narragansett Bay and Block Island,**
10. **Pawcatuck**

Other reports prepared during the course of the Study include the following:

Inventory Reports

For each of the ten planning areas, inventory reports were prepared covering the following subjects: climate, meteorology, hydrology, geology; land use, patterns, allocations, and management; special environmental factors; water supply; ground water management; water quality control; outdoor recreation; fish and wildlife; navigation; flood plain zoning and streamflow management; inland wetlands management; coastal resources; irrigation and drainage; sediment and erosion; power; minerals.

Special Reports

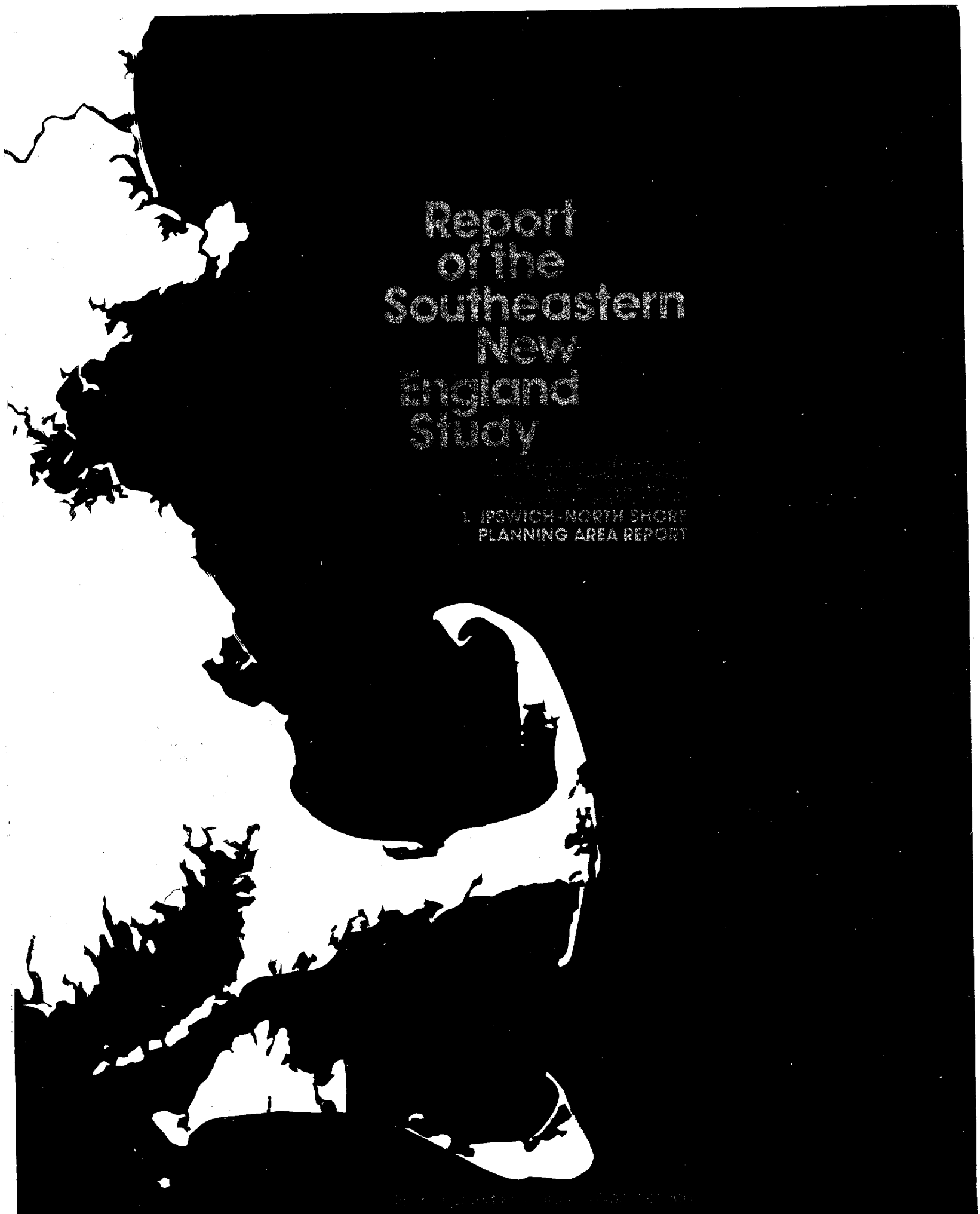
In addition to inventory reports, over a dozen special reports were prepared, including: Socio-Economic and Environmental Base Study, Volumes I and II; Economic analyses of water supply and demand issues, power plant siting, coastal resources allocation, and sand and gravel mining; Legal and institutional analyses of the state wetlands laws, arrangements for water supply service, fiscal policy and land control, access to natural resources areas, and management structure for water and land use issues; Urban Waters Special Study; Summaries of public workshops

Copies of reports are available from:

New England River Basins Commission
55 Court Street
Boston, Massachusetts 02108

National Technical Information
Service
Springfield, Virginia 22151

and also in each of the 208 libraries and 210 town halls throughout the SENE region.


Report
of the
Southeastern
New
England
Study
1. IPSWICH-NORTH SHORE
PLANNING AREA REPORT

REPORT OF THE SOUTHEASTERN NEW ENGLAND STUDY

READER'S GUIDE: HOW TO REVIEW THIS REPORT

- In five minutes

  FOR A "THUMBNAIL SKETCH"

  Read the **OVERVIEW** which folds out as one large sheet. There is an extra copy in the pocket in the rear for those who would like to mount it on the wall.

- In a half hour or less

  TO LEARN THE MAIN POINTS

  Read the **SUMMARY.** It is published separately. You can read it in either of two ways:

  - **SELECTIVELY.** Read the Chapters on Goals and Approach and Guiding Growth, plus any others that interest you. Chapters are boldly labeled to facilitate selective reading; or

  - **ENTIRELY.** Read the full summary for a fuller understanding of the highlights of the SENE Study.

- In one day or less

  TO UNDERSTAND THE DETAILS

  Read the **REGIONAL REPORT.**

  - **SELECTIVELY.** It is organized exactly like the summary. Wherever your interests lie, you can turn to those sections for additional background, amplifications, analysis of rejected alternatives, and especially for the full text of each recommendation, including who should do what and when. Also, remove the Development Capabilities Maps in the rear pocket and examine the legend to appreciate the type of information the maps portray; or

  - **ENTIRELY.** Read the full report for full appreciation of all recommendations, and how they interrelate.

- In an additional 10 minutes to 2 hours

  FOR APPLICATION TO YOUR AREA

  Get the **PLANNING AREA REPORT** for your locale. Scan it or read it to see how the broader recommendations presented in the Regional Report may apply to the area where you live or work.

TABLE OF CONTENTS

1. Ipswich-North Shore Planning Area Report

OVERVIEW

Ipswich – North Shore Planning Area

What is the point of the SENE Study program?

Balanced use and conservation of the region's water and related land resources is the program's objective. The Southeastern New England (SENE) Water and Related Land Resources Study was authorized and funded by Congress in response to the increasingly troublesome pressures the region's rapid urbanization was exerting on its rich and varied natural resources. The SENE Study had two major goals:

- To recommend actions for all levels of government and private interests to secure for the people of the region the full range of uses and benefits which may be provided by balanced use and conservation of the region's water and related lands.

- To assemble information on the resources at a consistent scale and level of detail.

What makes this Study different from others is that it is regional in scope, it comprehensively covers the full range of water and related land resource issues, and it proposes coordinated actions for all levels of government and private interests.

What does the SENE Study program cover?

The most important recommendations for this planning area include the following:

(1) To accommodate growth in environmentally and economically acceptable ways, municipalities should prohibit or restrict development on Critical Environmental Areas such as wetlands, flood plains, and well sites. Growth should be guided to Developable Areas which cover about 30 percent of the planning area. Within this category, municipalities should manage development on resources such as steep slopes, ledge, and soils with septic limitations. Development should be encouraged where services already exist or are planned.

(2) To provide sufficient amounts of public drinking water, existing ground and local surface water sources should be protected, one large regional reservoir developed, and MDC service expanded to some municipalities.

(3) To maintain and improve the quality of North Shore waters, municipalities should provide secondary levels of treatment and new facilities, some of them with advanced treatment.

(4) To meet recreational needs, existing parks, and public areas (especially public transportation) should be used more efficiently or expanded. Fish and wilflife habitat and other fragile resources should be protected and managed.

(5) To develop renewable and non-renewable ecologically and economically sensitive marine resources, offshore fishing activities should be limited within a 200-mile zone. Urban waterfronts should be revitalized through coordinated planning at all levels of government. Local shellfish management can be strengthened with more technical assistance from the state.

(6) To reduce flood and erosion damages, development should be prohibited from inland and coastal flood plains, a comprehensive flood plain management study made of the Ipswich River, and non-structural management measures encouraged wherever possible.

(7) To provide vital energy services, further investigation of the Newburyport and Saugus sites should be made as part of a broader key facilities investigation. To provide sand and gravel resources, statewide operating standards should be set for sand and gravel extraction. To provide adequate electrical power, sites suitable for power facilities should be identified now and set aside for future use.

What will the program do?

If the recommended actions are carried out, most 1990 needs for water, sewers, electric power, and outdoor recreation could be met using existing infrastructure, legal authorities, and institutional designs. Protecting Critical Environmental Areas will avoid potential dangers to life and property from flooding, erosion, and contamination of water quality and will provide highly productive greenbelts. As a result, new growth in this planning area can be accommodated without harming the high quality environment which attracted the growth in the first place.

You can take the first step in helping to carry out the actions by reading the recommendations in the SENE Study Regional and Planning Area Reports. Write your State and Congressional representatives about the Study. Urge your local planning and conservation officials to use the SENE planning process when developing or implementing master plans, zoning ordinances such as flood plain and watershed protection, and other water and land use decisions.

RECOMMENDATIONS

GUIDING GROWTH (Chapter 3)

1. Protect priority Critical Environmental Areas.
2. Restrict development on other Critical Environmental Areas.
3. Manage growth on Developable Areas.
4. Use SENE resource development capability analysis to guide future growth.
5. Accommodate growth where services already exist.

WATER SUPPLY (Chapter 4)

1. Institute water conservation practices in all municipalities.
2. Continue to use ground water in Wenham.
3. Develop additional ground water in six northern municipalities.
4. Regulate land use in recharge areas of planning area municipalities.
5. Revise and enforce septic tank regulations.
6. Use zoning regulations to restrict use on recharge lands.
7. Consider development of recharge structures in four municipalities.
8. Use existing surface water supplies in Lynn and North Andover.
9. Use existing ground and surface water in Manchester and Newburyport.
10. Continue transfer of water from Newburyport to Newbury.
11. Continue to supply seven municipalities with MDC sources.
12. Construct Reservoir 30-B to supply water to eight municipalities.
13. Rely on Lynnfield reservoir to supply 1990 needs of six municipalities.
14. Consider forming a regional water management agency.

WATER QUALITY (Chapter 5)

1. Carry out current state non-degradation policies in the planning area.
2. Attenuate runoff from new developments in at least eight planning area municipalities.
3. Study and define the landfill leachate problem.
4. Begin stormwater and wet-weather stream sampling in urbanized municipalities.
5. Provide pump-out facilities and treatment for watercraft wastes in coastal communities.
6. Form a regional sewer district of North Reading, Wilmington, Lynnfield, West Peabody and Middleton.
7. Construct an advanced watewater treatment facility in Hamilton after 1990.
8. Construct a secondary treatment facility in Lynn.
9. Provide secondary treatment for South Essex Sewer District.
10. Provide secondary treatment in Gloucester, Rockport, Swampscott, and Ipswich.
11. Construct an advanced wastewater treatment facility with ocean discharge in Essex.
12. Upgrade Newburyport treatment plant to secondary with discharge to the Merrimack River estuary.
13. Serve Groveland by Haverhill treatment facility.
14. Continue to serve North Andover by Greater Lawrence Sewer District.
15. Continue Metropolitan Sewer District service in Winthrop, Reading, Revere, and Wakefield.
16. Maintain existing secondary treatment facility in Manchester.

OUTDOOR RECREATION (Chapter 6)

Swimming

1. Secure public access to the shoreline.
2. Continue to investigate best methods to widen and protect Revere Beach.
3. Expand or improve public transportation to North Shore beaches.
4. Acquire Phillips Beach (in Swampscott) and West Beaches (in Beverly) for local use.

Boating

5. Encourage orderly boating growth in at least 5 municipalities.
6. Guide future development in at least 15 marinas.
7. Maintain channels, if justified by favorable economic and environmental benefits.

General Outdoor Recreation

8. Develop guidelines for low intensity recreation on storage water supply reservoir lands.
9. Designate the Ipswich River a component of scenic rivers system.
10. Acquire and develop 1000 acres near Ravenswood Park.
11. Develop trails and picnicking facilities in Lynn Woods.
12. Expand the Harold Parker State Forest.
13. Expand Breakheart Reservation.
14. Acquire islands along the North Shore coast.
15. Use SENE Development Capabilities Maps for open space and greenbelt programs.

Wildlife and Fresh Water Fisheries

16. Use Natural Resources Planning Program to enforce wetlands legislation.
17. Use Self-Help funds to acquire significant wetlands.
18. Change Great Ponds legislation for fishing ponds.
19. Acquire public access to 41 ponds.
20. Acquire public access to 15 streams.

MARINE MANAGEMENT (Chapter 7)

Offshore Fisheries

1. Continue to support an interim offshore 200-mile economic zone.
2. Support national fisheries management policy.
3. Improve market for underutilized fish species.
4. Accommodate coastal fish facilities through improved planning.
5. Allow privately financed purchase of foreign-built fishing boats.

Shellfish and Aquaculture

6. Increase state's technical assistance for local shellfish management.
7. Fund State to assist towns having aquacultural potential.
8. Give priority to new treatment plants with deep-ocean outfalls.
9. Research removal of virus and bacteria from wastewater to reduce shellfish health hazards.

Commercial Navigation

10. Conform with regional port development study findings.
11. Consider deepening Gloucester channel.

Urban Waterfronts

12. Coordinate local waterfront planning and development.
13. Provide guidance and set criteria at the state level for priority waterfront uses.
14. Review and coordinate waterfront use.
15. Provide federal funding for state and local waterfront development plans.

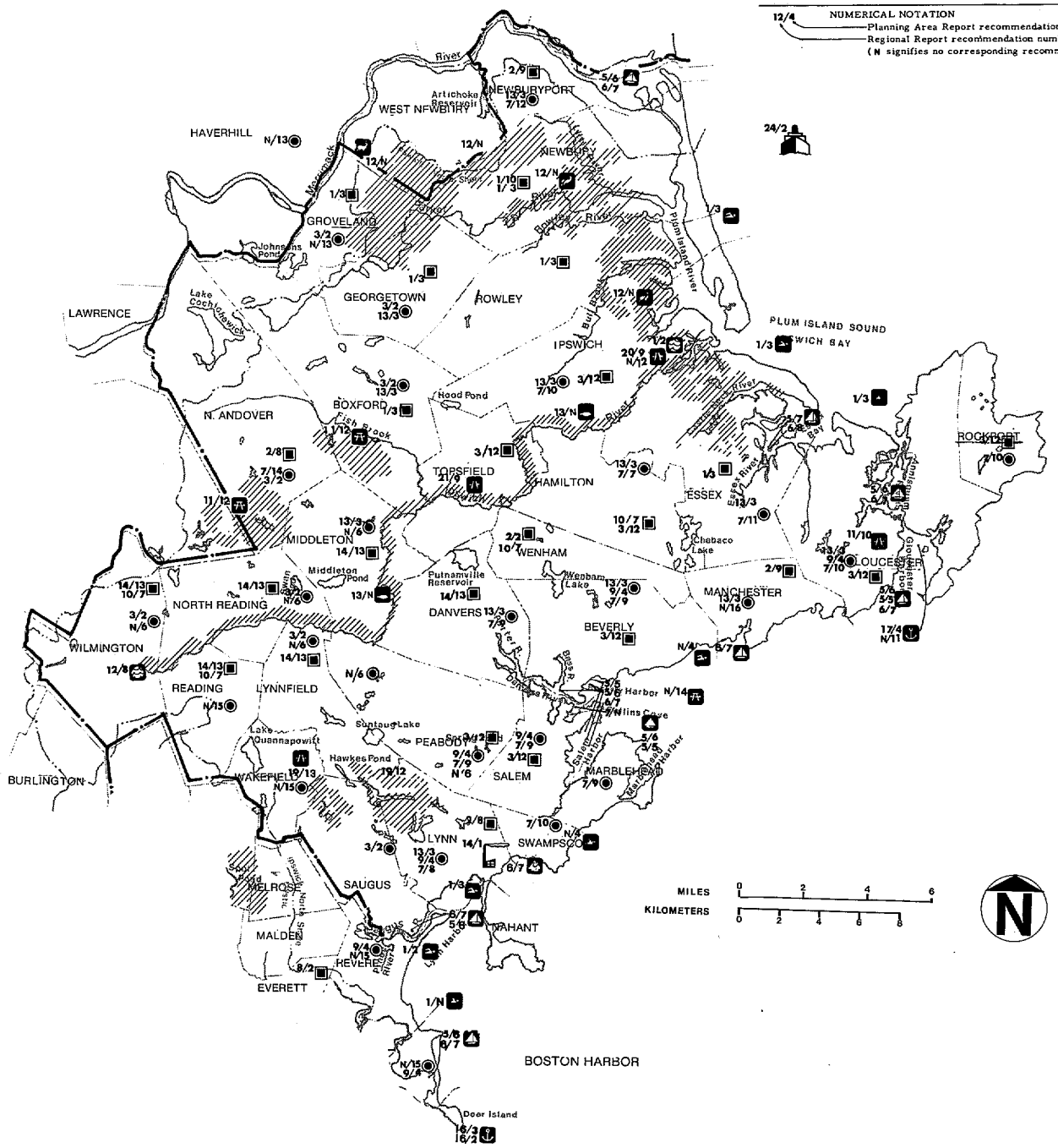
FLOODING AND EROSION (Chapter 8)

1. Develop flood plain management programs which maximize nonstructural solutions.
2. Undertake a comprehensive flood plain management study of the Ipswich River.
3. Adopt local flood plain zoning preventing adverse flood plain development.
4. Establish local sediment and erosion control ordinances.
5. Establish forest buffer zones.
6. Establish local regulations to strengthen flood plain management.
7. Acquire significant flood plains and wetlands.
8. Investigate a diversion channel in Wilmington.
9. Locate in existing safe buildings in the flood plain.
10. Encourage natural stabilization of coastal erosion areas.

LOCATING KEY FACILITIES (Chapter 9)

1. Reconsider the Lynnway site for a power plant.
2. Consider regional implications of petroleum facility siting policy.
3. Develop better terminal information on petroleum facilities siting.

The symbols on this map represent the recommended actions that can be shown on a town-by-town basis. The symbols are placed roughly within each town, and are not intended to be more specifically sited than that.



NEW ENGLAND RIVER BASINS COMMISSION
BOSTON, MASSACHUSETTS

SOUTHEASTERN NEW ENGLAND
WATER AND RELATED LAND RESOURCES STUDY

Ipswich North Shore Planning Area
Recommended Actions

CHAPTER 1 THEMES

This report on the Ipswich-North Shore planning area is one component of a comprehensive program for managing water and related land resources in the Southeastern New England (SENE) region. The Study's Regional Report has presented recommended policies and actions from a region-wide or statewide perspective. This Planning Area Report includes applications of those very broad recommendations to the cities and towns in the Ipswich-North Shore area.

One reason for preparing planning area reports is to connect the actions at the local level with the policy framework and considerations for state and federal levels. This direction was chosen in response to the region's long history of local autonomy, and to the Study's emphasis of placing decision-making at the lowest level commensurate with the anticipated scope of the decision. Because the recommended actions focus on water and related land resources, the planning area boundaries follow town lines most closely approximating the hydrologic boundaries of river basins.

Three common themes link all the reports:

- **Enhancing the environment enhances the economy.** The diverse coastal and inland water and related land resources have and will continue to support population and business growth in the Ipswich-North Shore planning area.

- **Anticipated growth can be accommodated, but it needs guidance.** The SENE Study represents a strong beginning. New growth will have to be carefully guided to avoid adverse impacts on the Ipswich-North Shore's valuable shoreline and critical land and water resources.

- **Existing knowledge, programs, and institutions provide the most realistic tools for achieving results, but some changes are needed.** Full use of ongoing programs, with some changes in how they relate to each other, was viewed as a way of "piggy-backing" on programs which already have weathered most of the realities of the political process. In choosing this strategy, the Study traded off novelty to increase achievability.

Each major chapter in this report contains actions to solve water and related land problems which we face now or can expect to face in the next 15 years, and in some cases into the next century. Table 1.1 sets out the intensity of these problems within each planning area, between them, and for the region as a whole. Of the seven resource subject areas studied, only one was judged a severe problem in this planning area:

- **Guiding Growth.** The Ipswich-North Shore planning area has proportionately more fragile water and related lands than most other SENE planning areas. These resources will increasingly be pressured by competing uses.

Four other subject areas were judged major problems:

- **Water Supply.** Presently there are adequate fresh water resources to supply projected 1990 demands. However, this situation could be upset by inter-town competition for ground and surface water resources, by the trend toward sewering with out-of-basin wastewater disposal, and/or by increasing rates of water consumption.

- **Water Quality.** The planning area's waters are, for the most part, of high quality. To take advantage of this situation, the need to preserve these waters and to restore others is all the more important.

- **Flooding and Erosion.** The wetlands in the Ipswich-North Shore planning area, important for keeping down flood damages, are proportionately more extensive within this planning area than any other in the region. If past experience is a fair indication, wetlands could disappear at a rate twice as large as the statewide average.

- **Locating Key Facilities.** The northernmost and southernmost coastlines are under consideration by Massport as sites for deepwater crude oil receiving terminals. Because of the varied and sensitive North Shore coastal resources, additional investigation – on a regional scale – prior to a decision about both offshore terminals and onshore facilities is essential.

TABLE 1.1 GENERAL INTENSITY OF SENE WATER - RELATED PROBLEMS BY PLANNING AREA

Key
- ● Severe problem
- ○ Major problem
- · Moderate problem
- Blank Minor or no problem

PLANNING AREAS	GUIDING GROWTH (Overall)	Protection of Critical Environmental Areas	Management of Developable Areas	WATER SUPPLY	WATER QUALITY (Overall)	Combined Sewers/Urban-Runoff	Municipal Discharges	Industrial Discharges	Low Streamflow	Land Use Discharges			Oil Pollution	Watercraft Wastes	RECREATION (Overall)	Swimming	Boating	Recreational Saltwater Fishing	Camping and Picnicking	Access to Hunting and Fishing Opportunities	Passive Outdoor Recreation	MARINE MANAGEMENT (Overall)	Offshore Fisheries	Shellfish and Aquaculture	Port Development	Offshore Sand and Gravel	Urban Waterfronts	FLOODING AND EROSION (Overall)	Inland Flooding	Coastal Flooding	Inland Erosion	Coastal Erosion	LOCATING KEY FACILITIES (Overall)	Availability of Sand and Gravel	Power Plant Siting	Petroleum Facilities Siting	Solid Waste Management
										Septic Systems	Agricultural Runoff	Landfill Leachate																										
Ipswich - North Shore	●	○	●	○	○	·	○	·	○	●		○	·	·	·	○	●	·	●	○	○	·	●	○			·	○	·	○		·	○	○	●		
Boston Metropolitan	●	○	○	●	●	●	●	●	·			○	○	·	●	●	●	○	○	●	●	○	○		●	○	●	·	○	·		·	○	○		·	
South Shore	○	·	○	·	○		○	·	○	○	·			·		●	○			○	·			·					○			·	○	○	○		
Cape Cod and the Islands	○	●	·	○	·		○			●	·	·		○	·		·		○	·				·								·		○			
Buzzards Bay	·	●			○	●	○	○		·	○			·	○		·			·			●	·			·							○			
Taunton	○	●	·	○	●	○	●	●	○	○	○		·		·	●			○	·	·	·					·			·			·				
Blackstone and Vicinity	●	·		●	●	●	●	●	·	·		○	○		○	○	○		○	●	○	·			○	○	·	●	●	·			·				
Pawtuxet	○	·	·		●		●	●	●	·					·	●		·		○									●					○			
Narragansett Bay	○	●	●	○	○	●	○	·					○	○	·	○	○	○		○	○	○	●	·	●		·	○				·	○		○	●		
Pawcatuck	·	○			·		○	○		○				·			·			·				·				○		○		·			○		
REGION AS A WHOLE	●	○	○	●	●	●	●	●	○	○	·	·	·	·	○	○	○		○	○	○	○	○		○	•	•	○	·	○		·	●	○	●	○	○

CHAPTER 2 THE SETTING

Located in the northeastern corner of Massachusetts, the Ipswich-North Shore planning area covers 428 square miles (270,000 acres). It is situated roughly north and east of Boston, south of the Merrimack Valley and west of the Atlantic Ocean. The thirty-two towns in the planning area are:

Beverly	Ipswich	Newburyport	Salem
Boxford	Lynn	North Andover	Saugus
Danvers	Lynnfield	North Reading	Swampscott
Essex	Manchester	Peabody	Topsfield
Georgetown	Marblehead	Reading	Wakefield
Gloucester	Middleton	Revere	Wenham
Groveland	Nahant	Rockport	Wilmington
Hamilton	Newbury	Rowley	Winthrop

Burlington and West Newbury are "fringe towns."

The planning area is underlain by sedimentary, metamorphic, and igneous rocks. The topography, typical of the Seaboard Lowland described in *Chapter 2 of the Regional Report,* is characterized by many low hills of unconsolidated glacial materials, rock exposures providing local relief, particularly in the Cape Ann area, and extensive poorly drained lowlands. These physical characteristics cause problems with drainage and the ability of soils to serve as a foundation for buildings. These characteristics are important considerations in deciding the location of the planning area's future development.

In this maritime climate, precipitation is high, averaging about 44 inches rather evenly distributed throughout the year. About half this rain evaporates or transpires to the atmosphere through vegetation. The remaining half flows through the area's river and streams, either directly as overland runoff, or indirectly as ground water seepage.

The Ipswich-North Shore area contains three major watersheds: the Ipswich, Saugus-Pines, and Parker Rivers. The Ipswich River is the largest and rises in the marshlands in the northern part of Burlington and meanders northeasterly for about 35 miles to its mouth at Plum Island Sound, an arm of Ipswich Bay. The Saugus River rises at Lake Quannapowitt in the northern part of Wakefield and meanders southeasterly for 13 miles to its mouth at Lynn Harbor. The Pines River flows easterly from the northwestern part of Revere for over three miles to the Saugus River in Saugus. The Parker River rises at the North Andover-Boxford town line and flows easterly 22 miles into Plum Island Sound. Two smaller coastal rivers are the Rowley and Danvers Rivers. The combined length of the five rivers is nearly 70 miles. They flow to the Atlantic through flat or gently rolling terrain, generally less than 200 feet in elevation.

These fresh water resources, particularly those in Wenham, Hamilton, Topsfield, Nahant, Reading, and North Reading, provide enough natural valley storage to avoid serious flood damages. Also, existing and potentially developable surface and ground water supplies in the northern portion of the planning area are sufficient to meet 1990 needs. Maintaining or improving water quality above existing discharges is important to ensure future water supply and to maintain outdoor recreation resources and fish and wildlife habitat.

The shoreline of this planning area – 130 miles long – is the third longest in the SENE region. Harbors and promontories define an irregular coast along its entire length. While long sandy beaches comprise the northernmost section of coastline, the central shore is characterized by rocky headlands, pocket beaches, and bluffs. The southern shoreline is composed of rocky shores, bluffs, and eroding beaches.

The 1970 population of the planning area was over 580,000, the third largest of all planning areas (about 12 percent of the region's population). The 1970 population density (2.1 persons per acre) is the second highest of all the planning areas after the Boston Metropolitan (5.1 persons per acre). Both these densities greatly exceed that for the region, 1.7 persons per acre.

The population grew by about 70,000 between 1960 and 1970, the second largest increase in absolute terms for SENE. According to Study projections it will climb to about 770,000 by 1990 and nearly a million by 2020. The anticipated 1990 growth rate for the Ipswich-North Shore planning area (32 percent) is nearly double SENE's anticipated 1990 rate (17 percent) and higher than that anticipated for the U. S. (23 percent). The anticipated 2020 growth rate in the planning area (50 percent) is higher than SENE's (45 percent) and about the same as the U. S. (51 percent).

The southern part of the planning area is located within the greater Boston metropolitan area where the 1970 per capita income ($3965) was by far the largest in SENE and 16 percent above the national average. With a total work force of over 196,000, the planning area employs about ten percent of the region's work force. Nearly a third of the planning area's work force is employed in manufacturing and construction. Another third of the work force is employed in services (finance, real estate, insurance) and government. The remaining third work

in agriculture, forestry, fishing, mining, retail sales, and wholesale trade and transportation. In the 1960's nearly 30,000 new jobs were added to the planning area. About two-thirds of them were in retail trade and educational, professional, and medical services. Employment in government, wholesale trade, and services related to finances increased the most in the remaining third. Manufacturing and mining declined by about 2500 jobs, or roughly 15 percent.

Early in the Study, participants at a public workshop expressed preferences for greater self-sufficiency of local water supplies, the most advanced water quality treatment possible, intensifying wetlands protection at a local level by improving technical and legal assistance, and acquiring large new natural areas for open space protection and for outdoor recreation.

Later, during the 90-day review period, over 275 state, regional, and municipal officials, federal agencies, and concerned citizens submitted comments on the Study's draft reports. The major comments are summarized in a Regional Report chapter, *"Review of the Report."*

There were several changes in the Ipswich-North Shore Planning Area Report as the result of the 90-day review. *Chapter 4* has a new recommendation encouraging the state to revise septic tank regulations, in response to strong public sentiment for this step. A study of erosion and shoaling problems at Winthrop Beach was suggested in *Chapter 6* at the request of municipal officials. The recommendation to encourage marina development was tempered to reflect citizens' and local officials' concerns that marina growth be controlled. During the Study's review period, state legislation failed to pass authorizing an exchange of administration between the Commonwealth and Department of Interior for Plum Island, so that mention of this was dropped from *Chapter 6. Chapter 7* no longer recommends assessing the aquaculture potential of Plum Island Sound and Essex Bay because recreation and protection of fragile coastal areas are the preferred uses of these areas, according to state marine officials.

Some implications of the foregoing discussion for the management of land and water resources are the following:

(1) The anticipated population growth will likely increase development pressures.

(2) Water resources are valuable assets for tourist development, domestic water supply, and flood control and should be managed in coordinated programs.

(3) As throughout the SENE region, the economy in this planning area is shifting away from manufacturing and mining towards services (professional, educational, medical) and, in this area, retail business. These businesses need highly educated and skilled people who, in turn, will be attracted to live in the area by certain environmental amenities.

CHAPTER 3 GUIDING GROWTH

The Ipswich-North Shore planning area's reputation of coastal and inland beauty has persisted despite the recent growth described earlier in this report. The concentration of people and new business will increase over the next 50 years, in part, as *Chapter 2 of the Regional Report* explains, because of this physical beauty. There are indications that this anticipated growth could alter the very water and related land resources which contribute to this reputation. The purpose of this chapter is to explore means of accommodating anticipated growth with the fewest unacceptable environmental damages possible.

The Situation

Anticipated Growth

The Ipswich-North Shore planning area is replete with a mixture of water and land resources. Almost three-quarters of the total planning area, some 188,000 acres, is unurbanized, according to 1970 figures. About half the planning area is forested upland and forested wetland; about 10 percent of the planning area is open or agricultural land; water represents 6 percent of the total area. Yet, the amount of land covered by urban uses in this planning area (26 percent) is somewhat higher than the amount for the region (21 percent), and second highest of all the planning areas after the Boston Metropolitan (41 percent). In 1960 urban land uses covered about 20,000 fewer acres (52,000 acres) than in 1970 (71,000 acres). The increase of 37 percent is somewhat lower than the regional increase for the same period (45 percent), but still a rapid rate of land consumption.

According to the preceding chapter, between now and 1990, the population could be over 30 percent larger than the 1970 population, and by 2020 the population could be nearly twice the size of the 1970 population, if the present birth rate continues. Assuming the most recent rate of land consumption, these populations would urbanize about 62,000 additional acres by 1990, and 126,000 additional acres by 2020.

The rates at which parts of the Ipswich-North Shore planning area will be urbanized will vary to some extent with relative development pressures. These pressures were estimated for municipalities throughout the SENE region on the basis of factors such as the growth rate of residential, commercial, and other uses, the relative accessibility of an area to employment and population in other parts of the region, and amount of easily developable land. The exact process for grouping towns by development pressure is defined *in Chapter 3 in the Regional Report.* While use of other more detailed factors, such as recent building permits or land consumption rates, may produce different results, combining these factors gives some useful indication of development pressures on the municipalities in the planning area, relative to all SENE communities (Table 3.1).

Accommodating Growth

To assess the implications of growth for land and water resources in the SENE Region the Study first identified and quantified the resources. Table 3.2 describes three major categories of resources, each differing according to development capability. There are two kinds of Critical Environmental Areas: Priority Protection Areas (Category A) and Other Protection Areas (Category B). Indiscriminate use of water bodies, well sites, wetlands, beaches, and critical coastal areas (Category A resources) poses a threat to health, safety, and welfare. Development of resources

TABLE 3.1 MUNICIPALITY BY DEVELOPMENT PRESSURE: IPSWICH - NORTH SHORE PLANNING AREA

High	Medium - High	Medium - Low		Low
Danvers	Boxford	Beverly	Newbury	Lynn
No. Andover	Georgetown	Essex	Newburyport	Manchester
No. Reading	Groveland	Gloucester	Revere	Nahant
Peabody	Lynnfield	Hamilton	Rockport	Rowley
Saugus	Reading	Ipswich	Salem	Swampscott
Wilmington		Marblehead	Topsfield	Wakefield
		Middleton	Wenham	Winthrop

Note: Communities are grouped into levels of development pressure relative to other communities in the Study region and do not necessarily reflect local building activity.

such as flood plains, prime agricultural soils, unique natural and cultural sites, upland erosion areas, and proposed reservoir sites and related watersheds (Category B) has certain environmental and economic costs. Some development is compatible with recharge areas for high yield aquifers, best upland wildlife habitat, high landscape quality areas, ledge and/or steep slope, and soils with severe or moderate septic limitations (Category C, F, and G), if guidelines like those discussed in The Solutions are observed. Use of the remaining land and water resources in this planning area is pre-empted by existing development (Category E) or private ownership (Category D). Most of the existing development is high density residential. But it is worth nothing that some of the developed areas can be used and further, that use and re-use of such land can be highly efficient.

These land and water resources for the Ipswich-North Shore planning area have been mapped on Plate 1 and the percent of the planning area in each category is displayed on Table 3.3. About a third of the land in the planning area has been pre-empted by public ownership (about 18 percent) or by existing urban lands (about 26 percent). Most of the urban area is concentrated in the southern portion of the planning area in Revere, Saugus, Lynn, and Wakefield. The sewer service system within the urban portions of the planning area can serve 70 percent of the 1970 population, or about 410,000 residents *(see Table 3.3 of the SENE Regional Report).* However, an additional 17 percent of the 1970 population (about 100,000 residents) requires sewers, but is unserved. This situation has implications for water resources which are explored in *Chapter 5 of this report.*

Critical Environmental Areas Categories A and B (see Plate 1) comprise 32 percent of the planning area, which is about the same percentage as most parts of the SENE

TABLE 3.2 THE SENE RESOURCE DEVELOPMENT CAPABILITY SYSTEM

CRITICAL ENVIRONMENTAL AREAS REQUIRING PROTECTION

Water Bodies (Category A), blue. [Includes estuaries, shellfish flats, and fish spawning areas.]
Priority Protection Areas (Category A), dark green: wetlands, well sites, beaches, and critical coastal erosion areas.
Other Protection Areas (Category B), light green: flood plains, class I and II agricultural soils, unique natural and cultural sites, [proposed reservoir sites and related watersheds, and upland erosion areas] excluding all "A" areas.

DEVELOPABLE AREAS REQUIRING MANAGEMENT, Excluding All A & B Areas

WATER RESOURCE LIMITATIONS
Aquifers and/or Recharge Areas (Category C_1) black dots: highest yield aquifers in each basin.

WILDLIFE AND SCENIC RESOURCE LIMITATIONS
Wildlife Habitat (Category C_3), black diagonal lines: best upland wildlife habitat other than publicly owned land and [commercial fishing grounds].
Landscape Quality Areas (Category C_2), black vertical lines: land characterized by high landscape quality other than categories C_1 and C_3.

SOILS RESOURCE LIMITATIONS
Ledge and/or Steep Slope (Category C_5), brown: land with slope greater than 15 percent and/or with rock near the surface.
Severe Septic System Limitations (Category C_4), orange: land with severe septic system limitations other than Category C_5.
Moderate to No Septic System Limitations (Categories F and G), yellow: land with moderate or no septic system limitations.

PREEMPTED USE AREAS

Urban Areas (Category E), gray: residential[5/] institutional, commercial and industrial development.
Publicly Owned Lands (Category D), beige: major public parks, forests, watersheds, and military lands.

Notes:

1/ All categories above, except those within brackets, are depicted on the development capabilities maps (plates 1, 2, 3).

2/ Categories in brackets are included to show where they would fit in the overall classification hierarchy, were they included on the plates in the pocket.

3/ All categories above, including those within brackets, are depicted on large-scale, unpublished maps available for inspection as part of the SENE Files.

4/ Categories C_1, C_2 and C_3 overlap with categories C_4, C_5, F, or G. Thus, Category C_3-C_4 is a wildlife habitat located on ledge or steep slopes.

5/ Mapped urban areas (Category E) include all-residential development, although the legend on Plates 1, 2, and 3 reads "residential areas on less than one acre lots."

region. **Category A, Priority Protection Areas** occupy about 19 percent of the planning area, and wetlands are the most important of these. *Wetlands* in the Ipswich-North Shore planning area represent a higher proportion of the total land area than any other planning area, over 18 percent. Inland wetlands are fairly evenly distributed in the planning area, and those in the Ipswich, Saugus-Pines, and Parker River basins are important for flood control. Topsfield, Hamilton, Wenham, North Reading, Reading, Rowley, North Andover, Groveland, and Georgetown are particularly well endowed with inland wetlands. Newbury, Rowley, Ipswich, Essex, and to some extent Saugus and Revere, have large expanses of tidal *estuaries* which are unique in New England. Between 1960 and 1970, however, 12 percent of the planning area's fresh water (non-wooded) and 7 percent of the salt water wetlands were lost. *Chapters 6 and 8 of this report and the Regional Report* discuss the value of wetlands for flood storage, ground water, plant and wildlife habitat, erosion control, and other purposes.

About 13 percent of the planning area is covered by **Category B, Other Protection Areas.** There are about 20,250 acres of *inland flood plains* and 23,900 acres of *tidal flood areas* (more than any other planning area in the region). Some development within these flood prone areas has aggravated flood damage problems which *Chapter 8* discusses. Newbury, Boxford, Ipswich, and Topsfield have most of the prime agricultural soils in the planning area, but these are major targets for development. The *Regional Report, Chapter 3,* discusses the significance of the loss of these areas. There are about 51,000 acres of natural areas and 128 unique cultural sites which are primarily concentrated in Newbury, Ipswich, Gloucester, Lynn, Rockport, Topsfield, Middleton, North Andover, and Groveland.

Developable Areas, Categories C, F, and G (mapped on SENE Development Capabilities Map, Plate 1) occupy the remaining third of the planning area (some 93,000 acres). This figure, among other things, includes a minimal amount of *best upland wildlife* habitat (70 acres). Development possibilities are extremely limited on the 15,500 acres of *ledge and slopes greater than 15 percent.* About a quarter of the total planning area is high landscape quality, defined by land use diversity and relief. Developable areas also include *soils with moderate to no septic limitations.*

A pertinent question is how much of the projected population Developable Areas could accommodate. The land consumption rate for the Ipswich-North Shore planning area during the decade of the sixties was about 0.3 acres for each additional person. Assuming a continuation of past trends, about 310,000 persons could be accommodated by the planning area's C, F, and G lands. This is more than the 188,500 additional persons anticipated by 1990, but less than the 450,000 persons anticipated by 2020. Should the land consumption rate increase to the regional rate of 0.5 acres for each additional person, the picture is somewhat different. In that case, only 185,000

TABLE 3.3 PERCENT OF LAND AND WATER RESOURCE CATEGORIES IN EACH PLANNING AREA

Planning Area	Total (in 1000's of acres)	Percent (%) of Planning Area				
		Critical Environmental Areas			Developable Areas	Preempted Use Areas
		A	B	A & B	C, F, G	D, E
Ipswich-North Shore	274	19	13	32	34	34
Boston Metropolitan	421	14	9	23	30	47
South Shore	172	17	13	30	43	27
Cape Cod & Islands	378	10	23	33	32	35
Buzzards Bay	205	17	16	33	47	20
Taunton	351	19	22	41	37	22
Blackstone & Vicinity	410	10	11	21	38	41
Pawtuxet	180	11	7	18	41	41
Narragansett Bay	212	16	16	32	34	34
Pawcatuck	262	27	12	39	40	21
SENE	2,865	16%	15%	31%	36%	33%

Sources: See Methodology in the Regional Report.

additional persons could be accommodated on C, F, and G resources. This number is somewhat lower than the projected 1990 population, and is significantly lower than the 2020 population.

The SENE Study's projections are by no means precise. *However, the foregoing analysis indicates that the ability of developable lands to accommodate growth is marginal for 1990 projections, and inadequate for 2020 projections.* Many municipalities in the planning area (the Town of Ipswich for one) have expressed the concern that this growth be controlled. This growth, combined with the existing inadequacy of the sewer service system, has potential negative implications for critical water and related land resources which can be minimized through solutions described below.

In addition to land use decisions resulting from the need to accommodate population growth, the planning area faces several decisions about siting large scale facilities and developments which are vital to the economic growth of the planning area and service the people's needs, but which have significant impacts on water resources. Sand and gravel resources, for example, are adequate to meet 1990 needs, but are frequently located in ground water recharge areas. Mining the sand and gravel must be done with care not to deplete or pollute the aquifer. Also, Massport recently released an interim report identifying, in order of preference, sites off Newburyport and Nahant as potential deepwater petroleum product receiving terminals. These issues are pursued in *Chapter 9 of this report.*

The analysis in this section points to the increasing pressures within the Ipswich-North Shore planning area to develop additional land in response to population and economic growth. The environmental quality of this portion of the SENE region will, in part, be important for attracting the highly skilled work force required for a services economy. Steps to accommodate new growth with minimal damage to the physical beauty of the planning area are urgently needed.

The Solutions

The previous section of this chapter has shown that developable water related land resources in the Ipswich-North Shore planning area may not be extensive enough to accommodate new population and economic growth, at least within the next 50 years. This means one of three things: (1) the land consumption rate is going to have to change, increasing densities on some areas, while ensuring protection of others; or (2) some of the growth will have to go to other parts of, or outside, the region, which may or may not have a surplus of developable resources (such as the Boston Metropolitan planning area); or (3) some of the growth will encroach on some of the Critical Environmental Areas. The choice of directions is not within the jurisdiction of the SENE Study.

Various levels of government can – in one way or another – control growth. *The Regional Report, Chapter 10,* suggests that the efforts of government should be coordinated by means of a statewide program. During the time such a structure is being instituted, however, municipalities can implement many of the recommendations with technical and financial assistance from regional planning agencies and the state.

Recommendations

There are a number of methods for protecting the fragile resources listed in Table 3.2. These include existing legislation, zoning, subdivision regulations, building codes, and purchase of fee simple or limited interest in land. Within the context of existing methods, it is recommended that municipalities, with the assistance of the Departments of Community Affairs and Environmental Management, through regional planning agencies:

1. **Protect Priority Critical Environmental Areas. Municipalities should prohibit development on Critical Environmental Category A resources (Priority Protection Areas). The appropriate uses of these resources include: water supply, fisheries production, limited recreation, or scenic and open space lands.**

Planning and zoning boards should protect **water bodies** from pollution by restricting adjacent development and by controlling urban runoff through subdivision regulations requiring stormwater detention ponds where feasible. The recommendations in *Chapter 5 of this report* will also help to achieve the state's water quality standards. **Estuaries and shellfish flats,** such as those in Newbury, Rowley, Ipswich, Essex, and Gloucester, should be protected by prohibiting new outfalls of any kind of effluent, dredging, sand and gravel mining, or installation of pipelines. **Wetlands** should be protected through more rigorous enforcement of existing legislation at the local and state level (*Chapter 8 of the Regional Report details how the legislation can be improved; Chapter 6 of the Regional Report discusses kinds of assistance available to municipalities).* Municipalities, using Massachusetts Self-Help Funds, and/or private interests should acquire the most valuable wildlife wetlands and surrounding uplands which are mentioned in *Chapter 6 of this report.* **Critical erosion areas and beaches** – particularly those in Newbury, Rowley, Ipswich, Essex, and Rockport – should be protected by zoning ordinances prohibiting development. *Chapter 6 of this report* includes recommendations for the recreational development of beaches; *Chapter 8* includes measures for controlling accelerating rates of erosion. In addition, municipalities should take steps to:

2. **Restrict development on other Critical Environmental Areas. Municipalities**

should restrict development on Critical Environmental Category B resources (Other Protection Areas). Suitable uses to be considered for this category should include agriculture, extensive recreation, forestry, or, in some cases, with proper management, very low density residential use.

Measures for protecting **flood plains**, *described in depth in Chapter 8 of the SENE Regional Report,* include local flood plain zoning prohibiting development, discouraging or prohibiting reconstruction after substantial storm damages, relocating some public facilities if structural protection is not available or practical. Structural methods required to remedy flooding problems in this planning area are described in *Chapter 8 of this report.* Prime agricultural soils should be protected at the state level by tax incentives, agricultural districts, and acquisition of development rights for the highest priority lands, and at the local level by methods such as transfer of development rights *(see Regional Report, Chapter 3, for more details).*

Proposed reservoir sites and unique natural and cultural sites should be protected by acquisition of fee simple, easement, or development rights. *Chapter 4 of this report* describes recommendations for reservoir development. **Upland erosion areas** should be protected by local sediment and erosion control ordinances *(discussed in Chapter 8 of the Regional Report).*

The nearly 93,000 acres of Developable Areas (Category C, F, and G resources) require some management to retain the intrinsic natural functions which these resources perform. Therefore:

3. **Manage growth on Developable Areas. Municipalities should manage growth on Category C resources and encourage growth on Category F and G resources, especially where infrastructure exists or is planned.**

It is worth noting that this recommendation deals with management of all developable areas, both within existing developed areas, and in areas yet to be developed; there are no developable areas in which management of some kind is not required.

On ground water **recharge areas** (of which there are about 12,000 acres scattered throughout the planning area), density should be restricted so that septic systems will not endanger ground water quality. Densities requiring sewers should be allowed only after analysis of the economic and environmental feasibility of recharge maintenance techniques to prevent depletion of the aquifer. For details about development standards refer to Table 3.4 *(also see Regional Report Chapter 4, Water Supply and Chapter 5, Water Quality).* Ordinances and building codes should control coverage by impermeable surfaces, require stormwater detention ponds to recharge run-off from roofs, streets, parking lots, and driveways. Regulations and sound engineering practices should be used to minimize the effect of activities hazardous to ground water quality, such as sanitary landfill, industrial waste disposal, highway deicing salt, and sand and gravel mining below the water table. On areas with **high landscape quality, best upland wildlife habitat,** and unsewered **soils with severe septic system limitations**, only development of very low density or clusters should be allowed. Development that would tend to preempt the resource values of wildlife habitat and landscape quality should be carefully evaluated to ensure that adverse impacts are fully taken into account. **Steep slopes** should be protected from erosion by low density use or with existing regulations for higher density uses.

Development on **soils with moderate limitations** should be regulated to correspond to the availability of sewers. Higher densities should be encouraged on F and G lands, as many C lands can sustain only very low densities.

The SENE Study findings represent a powerful beginning for all towns to implement this strategy. But the information on the SENE Development Capabilities Map (Plate 1) covers too large an area to allow use for site design detail. Municipalities can use the resource information on Plate 1 to set priorities on the resources which they prefer to manage first. Then they can concentrate on developing management guidelines for high priority resources which fit into existing ordinances and building codes using more detailed maps and data. The municipalities in most urgent need of taking these steps are those with significant amounts of Critical Environmental Areas, namely: North Andover, North Reading, Wilmington, Boxford, Reading, Georgetown, and Groveland.

Although local governments have much of the authority necessary to implement the concept of guiding growth based on resource capability, its implementation will be most effective if adopted as a matter of state policy. Many of the resources extend beyond town boundaries, and greater resources of funds and information exist at the state level.

The most expeditious way for the state to implement these concepts would be for the organization dealing with interagency policy – the Cabinet – to review and adopt as appropriate the policy issues suggested here.

Rhode Island has taken a powerful step in this direction by putting together a comprehensive land use plan. Massachusetts should continue developing a comprehensive policy for guiding growth. This decision is most appropriately made by an interdisciplinary organization and the SENE Study recommends that the Commonwealth:

TABLE 3.4 SUGGESTED* GUIDELINES FOR USE OF DEVELOPABLE AREAS SHOWN ON PLATES 1, 2, and 3

MAP COLOR / Soils Limitations	MAP PATTERN / Other Resource Limitations: NONE (color only) — No other Resource Limitations	High Landscape Quality (Category C_2)	Upland Wildlife Habitat (Category C_3)	Aquifer and/or Ground water recharge areas (Category C_1)
YELLOW — Moderate to No Limitations for septic system disposal (Category F & G)	- PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU	If clustered on no more than 50% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU Unclustered - . Low Intensity I/C . At least 1.0 ac/DU	If clustered on no more than 30% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At least 1/2 ac/DU Unclustered - . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 20% of area - - PW & PS . Any I/C . Any Res. - PW only . Med. Intensity I/C . At Least 1/2 ac/DU Unclustered - . Med. Intensity I/C . At least 1/2 ac/DU Unclustered or no PW & PS - . No I/C . At least 3 ac/DU**
ORANGE — Severe septic system limitations caused by conditions other than slope and ledge soils (Category C_4)	- PW & PS . Any I/C . Any Res. - PW only . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 50% of area - - PW & PS . Any I/C . Any Res. Unclustered or PW only - . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 30% of area - - PW & PS . Any I/C . Any Res. Unclustered or PW only - . Low Intensity I/C . At least 1.5 ac/DU	If clustered on no more than 20% of area - - PW & PS . Any I/C . Any Res. - PS only . Med. Intensity I/C . At least 1/2 ac/DU - PW only . No I/C . At least 3 ac/DU
BROWN — Ledge and/or steep slope greater than 15% (Category C_5)	- PW & PS . No I/C . At least 1/2 ac/DU *** - PW only . No I/C . At least 2 ac/DU	. No I/C . At least 3 ac/DU	. No I/C . At least 3 ac/DU	. No I/C . At least 3 ac/DU

* These are designed to provide a framework for designing guidelines of increasing specificity by state, regional, and local planners, and consultants more intimately knowledgeable with local circumstances.

** In many cases suggested guidelines for development, particularly for ground water, are estimates of probable safe controls made in the absence of greater knowledge of the effects of development on the pollution of aquifers.

*** Erosion control measures should accompany other restrictions on slopes over 15%.

Med. & Low Intensity - refers to water use/effluent discharge/building coverage

Clustering – refers to percent impermeable land surface area which may adversely effect the resource.

PW - Public Water Supply System
PS - Public Sewer System
I/C - Industry/Commercial
Res. - Residential
ac - acre
DU - Dwelling Unit

4. **Use SENE resource development capability analysis to guide future growth. The Massachusetts Cabinet, with the active participation of regional planning agencies and municipal government, should review and use the SENE Study's resource development capability analysis to develop a policy for guiding growth. Guidelines can be developed at the state, substate, or local levels of government.** *Chapter 10 of the SENE Regional Report describes several options for developing these guidelines.*

Chapter 3 in the Regional Report describes the economic inefficiencies and environmental detriments of urban sprawl. Making better use of roads, sewer systems, and water supply systems where they already exist could help to avert those costs. Therefore, it is recommended that policies be developed to:

5. **Accommodate growth where services already exist. The Massachusetts Cabinet, in concert with towns, regional planning agencies, and state agencies, should establish policies to accommodate further development in already developed areas to permit maximum use of existing water, sewer, and transportation services. Planned unit development and the cluster principle should also be encouraged in these areas.**

The Regional Report also recommends establishment of a system for determining criteria for locations of developments of regional impact. This would be within the framework of the system designed to protect Critical Environmental Areas and manage Developable Areas, and would enable consideration of environmental and economic ramifications of siting decisions. Power plant siting problems in this planning area would be under its jurisdiction. Details of this recommendation can be found in the *Locating Key Facilities Chapter 9* of this and the *Regional Report,* and *Chapters 3 and 10 of the Regional Report.* Consistent with siting criteria suggested for other facilities of regional impact, highway planners should give special consideration to avoiding critical resources (Categories A and B).

Priorities

While the Study encourages all municipalities to undertake this strategy the need is especially urgent in those with proportionately higher amounts of Critical Environmental Areas which will be under high or medium-high development pressure. Based on the discussion in The Situation section, these municipalities are: North Reading, North Andover, Georgetown, and Groveland.

Implications

The impact of these recommendations on development patterns in the planning area, considering the amount of area in each category and projected population, would be beneficial environmentally and economically. The proportion of the planning area in Category A and B lands is moderate (32 percent). A very high proportion of the area is already pre-empted by development and public use, however, as previously noted. Most of the growth anticipated over the next 50 years could be accommodated on land and water resources capable of supporting that development with the fewest environmental costs, but for the remainder, choices will have to be made between higher density, a different population distribution, or higher environmental costs.

CHAPTER 4 WATER SUPPLY

The Situation

The critical need for coordinated water resources management decisions among municipalities in the Ipswich-North Shore planning area is illustrated in the intertown competition for ground water as a source of local water supply and the intertown competition for use of Ipswich River flows. Water quality and recreational use of water should also profit from intertown cooperation and coordination.

Water consumption from planning area municipal sources in 1970 was 71 million gallons per average day (mgd). There is an existing safe yield of 79 mgd within the planning area, with the Metropolitan District Commission (MDC) supplying an additional 17 mgd. The 1990 design demand is expected to reach 127 mgd.

Ground water is the most economical alternative for local water supply if such resources exist in a town and the town is willing to accept the necessary restrictions on land use development required to protect the resources. A more detailed description of ground water benefits and limitations may be found in *Chapter 4 of the Regional Report.*

The Ipswich-North Shore planning area is one of the few areas in the Study region with topographic conditions and available water to permit surface water reservoir construction in order to meet future water demands. Although intertown surface water systems are no more economical than connections to the MDC, they are recommended in order to minimize the use of out-of-basin sources and reliance on the expansion of the MDC. *Chapter 4 of the Regional Report* contains further discussion on the desirability of in-basin water supplies.

Table 4.1 is a summary of the existing systems, and the 1990 average and maximum day demands of the Ipswich-North Shore planning area. The table also summarizes proposed additional sources for these towns.

The Solutions

Conservation of Water Sources

The actions recommended for the Ipswich-North Shore planning area stress the conservation and management of in-basin water resources and planning area self-sufficiency to the greatest possible degree. Participants in a recent series of public workshops strongly preferred this approach.

The Study therefore recommends that all municipalities:

1. **Institute water conservation practices.** **All municipalities in the Ipswich-North Shore planning area should institute water conservation practices as a precaution against increasing future dependence on imported water, particularly through metering, public education, use of water-saving technology, and elimination of lower rates for larger users wherever possible.**

Although water conservation practices alone were found to be inadequate to defray the need for development of additional water supplies, minimizing economic and environmental costs from any additional supply is still the major justification for the planning area to become more water conscious. Additional discussion of various water conservation measures is contained in *Chapter 4 of the Regional Report.*

Ground Water Sources

A large number of towns in the Ipswich-North Shore planning area rely, either totally or partially, on ground water supplies. It appears likely that the towns of Boxford, Groveland, Georgetown, Rowley, Essex, and Wenham will have adequate ground water resources to meet their 1990 demands. In addition, all of the remaining planning area towns except Lynn, Salem, Beverly, Gloucester, North Andover, and seven towns served by the Metropolitan District Commission, will continue to utilize existing ground water sources as an important part of their supply. Of the nine towns which are currently members of the MDC, two, Lynnfield and Peabody, have potential ground water resources which they can develop. This opportunity as well as other intertown surface water options discussed later in this report, should be carefully considered by both towns in their future water supply planning; either option can supply water at a lower cost than the MDC source.

The SENE Study recommends that the above municipalities take the following steps:

2. **Continue to use ground water in Wenham.**

3. **Develop additional ground water in six northern municipalities.** **Additional ground water resources should be developed in Essex, Rowley, Georgetown, Boxford, Groveland, and the western end of Newbury.**

TABLE 4.1 SUMMARY OF 1990 WATER SUPPLY PROPOSAL: IPSWICH-NORTH SHORE PLANNING AREA

Municipality	Existing System (1970) Source	Safe Yield[a] (mgd)	1990 Average Demand (mgd)	1990 Design Demand (mgd)	Proposed Additional Sources of Supply
Beverly-Salem	Wenham Lake & Longham Res.	3.1	13.77	Same	Topsfield Reservoir & Reservoir 30-B
	Ipswich River Diversion -- Legislated	8.3			
		11.4			
Boxford	Private Supplies		0.16	0.41	Ground water
Danvers-Middleton	Middleton Pond	1.1	5.49	Same	Lynnfield Reservoir
	Swan Pond	0.1			
	Emerson Brook	0.7			
	Wells	2.3			
		4.2			
Essex	Wells	1.1	0.52	1.20	Ground water
Georgetown	Wells	1.4	0.84	1.86	Ground water
Gloucester	Reservoirs & Quarries	3.5	5.00	Same	Reservoir 30-B
		0.5			
		4.0			
Groveland	Wells	1.0	0.87	1.91[c]	Ground water
Hamilton	Wells	1.7	1.40	2.94	Reservoir 30-B
Ipswich	Dow Brook Res.	0.4	1.87	Same	Reservoir 30-B
	Bull Brook Res. Wells	1.3			
		1.7			
Lynn	Hawkes Pond, Walden Pond, Birch Pond, Breeds Pond (Diversion from Ipswich River)	17.0	17.14	Same	Increase storage capacity
Lynnfield	MDC	0.3	1.36	Same	Lynnfield Reservoir
	Wells	1.4			
		1.7			
Manchester	Gravelly Pond	1.4	1.18	Same	None
	Wells	0.9			
		2.3			
Marblehead	MDC	2.2	4.25	Same	MDC
Nahant	MDC	0.6	1.26	Same	MDC
Newbury	Georgetown & Newburyport	0.2	0.61	1.38	Ground Water & Newburyport
Newburyport	Wells	1.4	3.17	Same	Increase storage capacity with approval of West Newbury
	Artichoke reservoir	1.6			
	Spring-fed pond	0.2			
		3.2			
N. Andover	Lake Chochichewick	3.0	4.78	Same	Merrimack River through Andover system
N. Reading	Wells	1.3	2.05	4.15	Lynnfield Res.
Peabody	Spring Pond	0.3	11.18	Same	Reservoir 30-B
	Suntaug Pond	1.4			
	Winona Pond	3.0			
	MDC-Lesiglated	1.0			
	Wells	1.5			
		7.2			
Reading	Wells	5.9	4.18	7.73	Lynnfield Res.
Revere	MDC	3.9	4.65	Same	MDC
Rockport	Cape Pond	0.3	1.50	Same	Reservoir 30-B
	Quarry Reservoir	0.2			
	Wells	0.2			
		0.7			
Rowley	Wells	0.9	0.35	0.84	Ground water
Saugus	MDC	2.9	4.79	Same	MDC
Swampscott	MDC	1.6	2.38	Same	MDC
Topsfield	Wells	1.5	1.36	2.86	Reservoir 30-B
Wakefield	Well	0.4	4.72	Same	MDC
	Crystal Lake	0.7			
	MDC	2.2[d]			
		3.3			
Wenham	Wells	1.7	.61	1.38	None required
Wilmington	Wells	7.1	5.30	9.54	Lynnfield Res.
Winthrop	MDC	1.8	2.17	Same	MDC

[a] Ground water yield reported as pumping capacity of system.

[b] Systems depending on ground water sources must be designed to supply maximum day demands.

[c] Includes 0.5 mgd for West Newbury.

[d] 1970 demand was 3.30 mgd. Assume MDC supplied 2.2 mgd.

Again, ground water resources afford these towns an economical source of supply and the freedom to remain independent of regional water supply systems. However, towns relying on ground water must be careful to protect the quantity and quality of their resources.

Ground Water Management and Intertown Cooperation. Some idea of the increasing conflicts for the use of ground water can be obtained by a discussion of the existing situation between Wilmington and Reading. The ground water supply of the downstream town of Reading depends on Ipswich River streamflow which infiltrates porous basin subsoils. Upstream, Wilmington taps ground water which otherwise would provide streamflow of the Ipswich River downstream to Reading. Withdrawal from Wilmington's wells thus severely reduces streamflow available to infiltrate Reading's aquifers during summer and early fall low flow periods. Increased withdrawal by Wilmington and Reading may lead to competition for ground water in the future.

A critical water shortage could develop during the next few years if the towns of Wilmington and Reading are lulled into a false sense of security by an extended period of average, or above average, precipitation and ground water recharge. If a drought struck the area when its water resources were already fully developed, demands could not be met. As an alternative, expensive emergency supplies might have to be imported from another source such as the MDC, or water use would have to be cut back. The most critical shortages would occur in the late summer or early fall when ground water storage is at its seasonal low and water demand is at its seasonal high. For these towns, as well as for many others in this basin, it is important that ground water supplies be maintained in sufficient quantities to supply their 1990 needs.

Ground Water Management and Land Use. The maintenance of ground water quantity and quality is closely tied to land use policies. Restrictions on land use activities in important ground water recharge areas are discussed at length in *Chapter 3, Guiding Growth, and Chapter 4, Water Supply, in the Regional Report.*

In addition to the ground water resources of the towns mentioned above, large ground water resources are located in Topsfield and Hamilton. Significant supplies are also present in Ipswich, Peabody, and Danvers. Because preservation of ground water quality is vitally important for these towns' future supplies, they should:

4. **Regulate land use in recharge areas of planning area municipalities. Land use in the recharge areas of Boxford, Groveland, Georgetown, Rowley, Essex, Wenham, Topsfield, Hamilton, Ipswich, Peabody, and Danvers should be strictly regulated. Facilities or activities hazardous to ground water quality such as highway deicing salt storage, and municipal or industrial waste disposal sites, should be restricted.**

Protection of ground water quality through land use regulation is mandatory if towns are to rely on this source of supply. The relatively low cost of ground water justifies the towns' commitment to the management of this resource. *Chapter 3, Guiding Growth in the Regional Report,* describes methods of protection in greater detail.

In addition, individual septic systems are often a threat to ground water quality. Soils may be improper for leaching, or the water table may be too high to allow proper filtration of wastewater. There are strong public sentiments that existing regulations for the development of septic tanks are inadequate and there is a need to:

5. **Revise and enforce septic tank regulations. The Department of Environmental Quality Engineering should review and update septic tank regulations, with particular attention to the allowable depth of subsurface systems to ground water, and the maximum rate of percolation. In addition, the above-mentioned towns should make a special effort to enforce septic tank regulations.**

Furthermore, opportunities exist for applying appropriate zoning to ground water recharge areas in order to reduce contamination from septic systems. Therefore, the above towns should:

6. **Use zoning regulations to restrict use on recharge lands. Planning area municipalities should use zoning regulations to restrict high density land use on significant ground water recharge areas until it can be shown that higher densities could be tolerated without taking additional precautions such as sewering the areas.**

An expanded discussion of land use and water quality aspects of water supply can be found in *Chapters 3, 4, and 5 of the Regional Report.* Again, the maintenance of ground water quality depends to a great extent on the land use of the recharge areas. Towns must control development on these areas in order to provide high quality ground water for future uses.

Opportunity may exist in the towns of Hamilton, Wenham, Wilmington, and Reading for development of recharge basins in areas adjacent to well fields. Sand and gravel pits, because of their high infiltration capacity, can be modified to replenish ground water supplies. Storm runoff can be diverted to these recharge basins by drains from areas where the amount of permeable land surface has been significantly reduced by construction and paving, thereby increasing ground water quantity and protecting surface water quality. For these reasons, and in order to encourage

a policy of in-basin self-sufficiency by maintaining existing water resources within the basin:

7. **Consider development of recharge structures in four municipalities. Development of recharge basins should be considered in Hamilton, Wenham, Wilmington, and Reading.**

The importance of ground water resources to these towns requires that they replace natural recharge areas destroyed by development and the proliferation of impermeable surfaces. A more detailed discussion of this point may be found in *Chapter 4 of the Regional Report.*

Surface Water Options

Fourteen of the thirty-two Ipswich-North Shore planning area towns rely either partially or completely on surface water sources, not including seven municipalities served by the Metropolitan District Commission (Table 4.1). Some of these towns will be able to develop additional local ground and surface supplies, to meet their 1990 needs. For these towns, the SENE Study makes the following recommendations:

8. **Use existing surface water supplies in Lynn and North Andover. Existing surface water supplies should continue to be used in Lynn and North Andover. North Andover should negotiate an agreement with Andover for additional surface water supplies.**

9. **Use existing ground and surface water in Manchester and Newburyport.**

10. **Continue transfer of water from Newburyport to Newbury.**

If the current ground or surface water resources of a town will be sufficient to meet its 1990 needs, it is generally true that continued use of these resources will be the town's most economic source of water supply.

It is anticipated that the MDC will be able to supply the 1990 needs of the seven towns which it currently serves in this planning area. The SENE Study makes the following recommendation:

11. **Continue to supply seven municipalities with MDC sources. The MDC should continue to supply the demands of Nahant, Revere, Saugus, Wakefield, Winthrop, Marblehead, and Swampscott.**

This recommendation represents the only viable alternative for the above towns and will provide them with sufficient water supply through 1990.

Several other towns in the Ipswich-North Shore planning area, however, will be unable to meet their 1990 demands unless additional supplies are provided. A number of alternative water supply configurations were considered to meet these demands. Among those evaluated was the exclusive use of in-basin resources with augmentation of existing supplies by ground water sources. Under this alternative, significant reductions in the growth of per capita consumption would be necessary in 16 towns.

Three broad alternatives to meet the planning area's future water demands were investigated by the Study:

(1) Several towns, working with the Water Resource Commission, have prepared studies of alternative surface water projects to meet their individual 1990 needs. These individual plans call for construction of at least four separate reservoirs, and the further utilization of ground water to supplement the systems.

(2) Significant expansion of the Metropolitan District Commission's service area was considered. However, it is not expected that the MDC will have sufficient supply to support rapid expansion of its service area before 1990.

(3) A proposal by the Water Resource Commission to construct a single large reservoir (Reservoir 30-B) located offstream in a wetland area adjoining the Ipswich River in Ipswich was also considered. According to one plan, the reservoir would have an estimated safe yield of 25 mgd and would utilize diversion from the Ipswich River during high flow periods only.

The option to build a single large reservoir rather than several smaller ones was strongly favored by planning area residents who attended the Study's Basin Advisory Committee meetings. However, the selectmen of Ipswich can refuse to approve the Water Resources Commission's acquisition of the land required for the reservoir to the state, and may exercise that option. At the present moment the selectmen have no position about the Reservoir because they feel they do not have sufficient information to judge on the advisability of the project. Nevertheless, the SENE Study suggests that 30-B would have several advantages over other alternatives and should be endorsed. The reservoir will be less costly to individual towns than the expansion of the MDC system. In addition, the regional supply system established to provide water to the participating towns from Reservoir 30-B would result in wider cost sharing arrangements, lower total capital costs, lower overall treatment costs, and increased operational efficiency. This solution would also be the most flexible of those considered because its storage capacity would be large enough for augmentation from a cleaner Merrimack River after 1990.

The SENE Study recommendation is as follows:

12. **Construct Reservoir 30-B to supply water to eight municipalities. Reservoir 30-B should be constructed to supply part or all of the water for Gloucester, Rockport, Ipswich, Hamilton, Topsfield, Beverly, Salem, and Peabody. Maintenance of the reservoir and the distribution of supplies could best be handled by the establishment of a regional water supply system by the above municipalities. As is true throughout the SENE region, existing surface and ground water supplies must also be maintained to make the most efficient use of newly developed sources.**

Such a regional surface supply will provide a fairly economical and very dependable source of water for the eight participating towns. This recommendation is of high priority. Most of the land for the reservoir has already been identified. In addition, some of the participating municipalities will need additional water within a fairly short time, and will have few alternative sources. Moreover, other municipalities in the planning area may require additional supplies from Reservoir 30-B after 1990. Salem and Beverly have been included in this recommendation although the Salem-Beverly Water Supply Board proposes to develop a new reservoir in Topsfield and is very close to acquiring the necessary land. However, the Board has also recently forwarded official support of Reservoir 30-B to the Metropolitan Area Planning Council, and it appears that Beverly and Salem will wish to consider 30–B as a long-term option for their water supplies. Because the Ipswich River has high value for fish and wildlife production and visual amenities, the full environmental implications of the flood skimming must be assessed.

Six additional municipalities in the Upper Ipswich River basin were originally proposed for inclusion in the Reservoir 30-B service area. It appears, however, that these municipalities will have the opportunity to meet their 1990 needs through an alternate source. Lynnfield is presently constructing a reservoir which will have a safe yield of about 4 mgd. This source will be sufficient to meet the additional average day demands in Lynnfield, Danvers, Middleton, and North Reading up to 1990. After this date, the six municipalities could rely on Reservoir 30-B supplies for any additional needs. Therefore, it would be prudent for the distribution system to be designed with the future connection to Reservoir 30-B in mind. The SENE Study makes the following recommendation:

13. **Rely on Lynnfield reservoir to supply 1990 needs of six municipalities. Lynnfield, Danvers, Middleton, North Reading, Reading, and Wilmington should rely on the Lynnfield reservoir to supply their additional water needs through 1990. The distribution system for this supply should be designed to make economical interconnections with the Reservoir 30-B system after 1990.**

The above municipalities will thus be able to maximize the use of a newly-developed source while maintaining the flexibility necessary to take advantage of another in-basin source at a future time.

Implementing the Plan

Coordinating Ground Water and Surface Water Management. The Ipswich-North Shore planning area requires a greater degree of coordination between ground and surface water management, including coordinated policies of water supply and wastewater disposal. The degree of interaction between ground water development and wastewater disposal requires greater control over aquifers than is currently the practice in the planning area.

For the future, it is certain that communities will continue to operate and maintain existing ground and surface water facilities. They will also purchase land to protect and keep available future ground water sources. Although the Massachusetts Department of Environmental Quality Engineering has the authority to determine the quality of water supply for public use, and although local water departments restrict incompatible uses in a 400 foot diameter around their wells, there is no state law which directly protects and manages ground water recharge areas. The SENE Study recommendation is as follows:

14. **Consider forming a regional water management agency. Member communities in the Ipswich River Watershed District and the Massachusetts Water Resource Commission should deliberate now on the formation of a regional water agency to operate and maintain a regional water supply system and to advise the towns in local water supply and water quality management.**

Such a regional water agency would be able to efficiently coordinate local efforts to maintain or improve water quality in the planning area. It would also determine a single set of standards for the entire area, rather than relying on individual towns to set multiple, possibly conflicting water management policies. Further discussion of water management agencies may be found in *Chapter 4 of the Regional Report.*

CHAPTER 5 WATER QUALITY

The Situation

The Ipswich-North Shore planning area's river and coastal waters are for the most part of good quality. The water along the planning area's 130 miles of shoreline currently meets Class SA and SB goals, with only localized exceptions (Gloucester Harbor is meeting SC goals). However, the Saugus and Pines Rivers estuary is well below its Class SB goals due primarily to a landfill operation in Saugus. In addition, several of the harbors receive wastewaters from municipal treatment facilities providing less than adequate treatment. Of the fresh waters in the planning area, all of which have Class A or B goals, only the Ipswich River is below its Class B standards. Low streamflows coupled with poorly sited municipal landfills and malfunctioning septic systems result in existing quality not suitable for swimming. Unlike the high quality Parker, Rowley, and Saugus Rivers, costly abatement measures are needed to restore the Ipswich as a valuable recreational and water supply resource.

Currently over 400,000 people in the planning area are served by sewer systems, all of which discharge to coastal waters (see Table 5.1). If the trend toward sewering with out-of-basin wastewater disposal continues in the Ipswich River watershed, severe ground water and stream flow depletion will result.

Four Ipswich River basin towns withdraw ground water from aquifers in the basin and discharge it as wastewater to out-of-basin treatment facilities: Reading discharges to the MDC Deer Island facility, Peabody and Danvers to the South Essex Sewer District plant, and Ipswich to its own facility discharging to the Ipswich River estuary. Therefore, streamflow in the Ipswich River below each diversion is depleted by an amount approximately equal to the ground water withdrawn. The effect on the river is especially critical during low flow periods (August through October) when streamflow is almost entirely dependent on ground water.

TABLE 5.1 SEWER SERVICE: IPSWICH - NORTH SHORE PLANNING AREA

Sewer System	1970 Population Served	Degree of Treatment	Receiving Waters
South Essex Sewer District		Primary	Beverly-Salem Harbor
Beverly	34,300		
Salem	40,000		
Danvers	21,000		
Peabody	29,810		
Metropolitan Sewer District		Primary	Boston Harbor
Reading	13,974		
Revere	41,864		
Wakefield	21,338		
Winthrop	20,335		
Wilmington	171		
Lynn		None	Lynn Harbor
Lynn	30,000		
Saugus	14,062		
Manchester	3,297	Secondary	Ocean
Nahant	4,067	None	Broad Sound
Gloucester	16,485	None	Gloucester Harbor
Ipswich	3,978	Primary	Ipswich River Estuary
Marblehead	20,230	None	Ocean
Newburyport	15,807	Primary	Merrimack River Estuary
Rockport	3,530	None	Sandy Bay
Swampscott	13,195	Primary	Ocean

Additionally, increased summer withdrawals by towns with wells adjacent to rivers and which return water to the basin by septic systems will lower streamflow during the low flow period as a result of the lag between pumping and recharge. All of this results in adverse impacts on a stream's natural regenerative ability, on aquatic and wetland ecology, recreational boating, bathing, water supply, and the river's overall aesthetic values.

The Solutions

Preservation

For the reasons outlined in *Chapter 5 of the Regional Report, Water Quality,* the SENE Study places highest priority on the preservation of existing high water quality. Since so much of the planning area enjoys high quality waters, preservation techniques are particularly appropriate here.

A regional water quality recommendation endorsing the state's antidegradation statement, would affect all the coastal waters of this planning area except Gloucester Harbor, which has a proposed classification of SC. All other coastal waters will be SA and SB. Except for the Ipswich River, which is discussed below, no new wastewater discharges of any type will be allowed to any fresh waters of the planning area. Since there are no industrial discharges to those waters now, this will ensure maintenance of high quality streams and ponds throughout the area. The SENE Study's recommendation is as follows:

1. **Carry out current state non-degradation policies in the planning area. The Massachusetts Department of Environmental Quality Engineering should ensure that no new discharges will deteriorate the quality of stream water above the most upstream municipal discharges and Class SA and SB waters (shellfish harvest and swimmable-fishable salt water), with conditional exceptions: (a) to allow new cooling water discharges if standards are met; (b) to allow new municipal discharges if part of a comprehensive plan; and (c) to require existing discharges to cease, and either connect to a municipal system, or provide high degrees of treatment consistent with maintaining high quality waters.**

A regional water quality recommendation, calling for strict subdivision regulations to reduce stormwater runoff, should be given highest priority in those towns having the greatest development pressures and bordering high quality streams. These towns include: Wilmington, where the potential exists for stormwater detention basins for ground water recharge (*see Water Supply chapter of this report*; North Reading, North Andover, Saugus, Lynnfield, Groveland, Georgetown, and Boxford). For these towns, the SENE Study makes the following recommendation.

2. **Attenuate runoff from new urban developments in at least eight planning area municipalities. The Massachusetts Department of Community Affairs should encourage municipalities to adopt subdivision controls which emphasize open areas and the use of permeable drainage ditches, and provide attractive, safe stormwater detention ponds, thereby also augmenting ground water recharge.**

Because approximately 52 percent of the population in the Ipswich-North Shore planning area uses septic systems, it is important that effective criteria for locating, siting, and designing individual subsurface systems be established and enforced. Cumulative failures of these systems have brought about the need for sewers in Wilmington, North Reading, and Essex. Implementation of the recommendation could result in a lessening of pressure for sewer service in other unsewered towns, further enhancing water quality. A more detailed discussion of septic systems and their management may be found in *Chapter 5 of the Regional Report.*

Restoration

While much of the planning area is favored with high water quality, pockets of pollution do exist. In these areas, the emphasis is on restoration through regulation, permitting, and facilities construction to reach proposed water quality goals.

Regional water quality recommendations presented in *Chapter 5 of the Regional Report* which are particularly appropriate in this planning area include: landfill investigation and water quality sampling, stormwater sampling, and pump-out facility construction for watercraft wastes.

Towns which have been identified as having landfills causing problems associated with surface drainage, leachate, and the lowest portion of the fill in the water table include: Beverly, Hamilton, Lynn, and Manchester. Landfills in Ipswich, Georgetown, Danvers, Gloucester, Boxford, Essex, Middleton, and Newburyport have one or two of the above characteristics. North Reading and Wilmington also have landfill problems.

The SENE Study recommends that the Department of Public Health and these municipalities:

3. **Study and define the landfill leachate problem. The Massachusetts Department of Environmental Quality Engineering and individual municipalities should make further field investigations and studies to better define the extent and nature of water quality problems associated with**

existing and abandoned solid waste disposal sites, with a view to developing adequate perspectives and rational controls.

Additional discussion of pollution from landfills may be found *in the Regional Report in Chapter 5, Water Quality.*

There are coastal communities in the Ipswich-North Shore planning area where significant urban concentrations exist and where water quality standards may be violated, in part due to urban runoff. These municipalities include: Gloucester, Beverly, Salem, Peabody, Lynn, Revere, and Winthrop. In order to provide a rational basis for a major, badly needed non-point source abatement program, the SENE Study recommends that the Department of Environmental Quality Engineering:

4. **Begin stormwater and wet-weather stream sampling in urbanized municipalities. Everywhere, but particularly in the above municipalities, the Massachusetts Department of Environmental Quality Engineering should begin a major year-round stormwater and wet-weather stream sampling program.**

Chapter 5 of the Regional Report contains further consideration of urban stormwater runoff problems for the SENE region as a whole.

Because of potential pollution from recreational boating wastes, a regional water quality recommendation calling for provision of pump-out facilities to handle these wastes should be implemented at marinas and at the existing and proposed coastal treatment plant sites in the planning area:

5. **Provide pump-out facilities and treatment for watercraft wastes in coastal communities. The Massachusetts Department of Environmental Quality Engineering should: (a) have publicly owned treatment plants along the coast provide pump-out facilities; and/or (b) require all marinas in heavily congested harbors and adjacent to major harvestable shellfish beds and swimming areas to provide pump-out facilities with either adequate treatment or disposal to a municipal system.**

Shellfishing and beach swimming, particularly on Cape Ann and coastal points northward, are extremely important to the economy of this planning area,and this recommendation will help to protect these activities from potential water quality degradation.

Municipal Facilities. The following discussion presents a facilities-oriented approach to cleaning up the Ipswich River and the isolated harbors and bays affected by discharges of treated and untreated municipal wastewater.

Restoration alternatives for upstream Ipswich River basin communities dealt with sewering, degrees of treatment, disposal methods, and feasibility of regionalization. These topics are discussed in detail in *Chapter 5 of the Regional Report.* Sewering is needed immediately in North Reading and Wilmington due to malfunctioning subsurface disposal systems. Lynnfield will also need sewering. Middleton, with existing low densities and development pressures, will need only a small collection system. To alleviate the problem of continued out-of-basin wastewater discharges discussed above, it is recommended that wastewaters from an advanced treatment facility proposed for these four towns be discharged to the Ipswich River. Based on the information available, land disposal was not considered to be a viable alternative due to a lack of suitable sites of sufficient size to accommodate the volume of wastewater flows expected from this facility.

The Massachusetts Division of Water Pollution Control is developing load allocations for several of the streams in the SENE region. The following recommendation should be evaluated and included in the Division's plan for the Ipswich basin:

6. **Form a regional sewer district of North Reading, Wilmington, Lynnfield, West Peabody and Middleton. A regional sewer district should be formed consisting of the towns of North Reading, Wilmington, Lynnfield, Middleton and West Peabody. The district should construct and operate an advanced wastewater treatment facility in North Reading to serve all five towns. Discharge would be to the Ipswich River.**

Citizen participants at SENE workshops in the planning area favored the North Reading location over one farther downstream in Middleton despite a somewhat higher cost, so that as much of the river as possible could benefit from the higher summertime flows which would result. Significant downstream water supply and recreational benefits would accrue. Two important points should be brought out. The first is that a small portion of Wilmington has sewer service which discharges to the MDC system. Rather than provide similar service to the rest of the town, the above alternative is deemed more responsive to the maintenance of in-basin water resources. The second point concerns the policy of the Massachusetts Department of Environmental Quality Engineering which currently prohibits wastewater discharges to the Ipswich River since water supply diversions occur during high flow months. Peabody and the Salem-Beverly Water Supply Board flood skim and store the water in reservoirs prior to complete treatment. Lynn does the same but only provides chlorination. If Lynn were to pro-

vide full treatment, the holding reservoirs and treatment, coupled with the dilution effect of the high flows, would tend to be partial safeguards if plant breakdown occurred. Safety mechanisms to prevent this breakdown would also be needed. The district should be formed as soon as possible so a planning grant could be obtained from federal fiscal year 1976 funds.

The Boston Harbor-Eastern Massachusetts Wastewater Study (EMMA) recommendation is that Lynnfield and Wilmington join the MDC system. The SENE Study recommendation differs from this because it is believed that out-of-basin transfer of wastewater will adversely affect both the Wilmington and Reading water supply (page 4-3) as well as flows in the Ipswich River during dry periods. Because of the difference between the recommendations of the EMMA Study and the SENE Study, presumably the Metropolitan Area Planning Council, in cooperation with the U.S. Geological Survey, will conduct further investigation of the implications for ground water and low flows during its Section 208 Water Quality Program.

A second treatment facility with discharge to the Ipswich River should be considered for long-range needs. The SENE Study makes the following recommendation:

7. **Construct an advanced wastewater treatment facility in Hamilton after 1990. Hamilton should construct an advanced wastewater treatment facility discharging to the Ipswich River at some time after 1990. The facility would serve portions of Hamilton and Topsfield.**

Current pressures for sewering in these two towns are not great. Enforcement of laws regulating subsurface disposal systems, coupled with low development pressures, would postpone the requirement of a treatment facility until after 1990.

With control of septic systems and construction of the upstream advanced treatment facility, the goals of swimmable-fishable waters in the Ipswich River can be achieved by the 1983 target date. The long-range construction of the Hamilton facility will help to maintain that quality thereafter.

To assure the achievement of these water quality goals and to manage the complex interrelationships between ground and surface water supply and water quality within the Ipswich River Basin, the *Water Supply Chapter of this report* recommends the creation of a regional water planning advisory agency. More detailed discussions of the authorities and responsibilities of such an agency and the alternative institutional arrangements available may be found in *Chapters 4 and 5 of the Regional Report.* With regard to water quality, the water management agency could set necessary streamflow requirements, treatment plant efficiency criteria, and ground water withdrawal regulations.

For coastal communities, the SENE Study endorses existing facility plans developed by municipalities approved by the Massachusetts Division of Water Pollution Control, such as the following:

8. **Construct a secondary treatment facility in Lynn. Lynn will construct a secondary treatment facility with ocean discharge which will serve Lynn, Nahant, and Saugus.**

The Lynn and Nahant systems are on this year's Construction Grants Project List for planning and design *(see Chapter 5 of the Regional Report).* Construction could be completed in two to four years. This will eliminate untreated wastewater discharges from the Lynn-Saugus system and Nahant.

Further, the SENE Study makes the following recommendation:

9. **Provide secondary treatment for the South Essex Sewer District. The South Essex Sewer District, which serves Beverly, Salem, Danvers, Peabody, and Marblehead, will provide secondary treatment.**

This will eliminate one untreated discharge from Marblehead and improve the inadequate primary discharge degrading outer Beverly-Salem Harbor from the South Essex Sewer District communities. Again, construction grant priority has been given, and construction could be completed by 1977.

In addition, the SENE Study recommends that four planning area communities:

10. **Provide secondary treatment in Gloucester, Rockport, Swampscott, and Ipswich. Gloucester, Rockport, and Swampscott will provide ocean discharge.**

All municipalities in the above recommendation, except Swampscott, have received construction grants, and most are under construction. However, Gloucester's facility is being delayed until a state environmental assessment can be prepared. No federal funds are involved in that construction.

Essex will make great strides in improving coastal water quality if it follows the next recommendation:

11. **Construct an advanced wastewater treatment facility with ocean discharge in Essex.**

This recommendation is high on the Massachusetts construction grant priority list. Advanced treatment is necessary to protect some of the shellfish flats in the Essex River, presently closed due to bacterial contamination from malfunctioning septic systems. However, the proposed plant site is in a marsh, and the plant may have to be relocated. Then secondary treatment with ocean discharge may be feasible, while more positively protecting shellfish beds.

Another high priority action contributing to improving coastal water quality is to:

12. **Upgrade Newburyport treatment plant to secondary with discharge to the Merrimack River estuary.** **Provisions will be made to serve Newbury, which needs sewers in some sections.**

An application for funds has been made for a required interceptor in fiscal year 1975 in order to:

13. **Serve Groveland by the Haverhill treatment facility.** **This facility will discharge secondary effluent to the Merrimack River.**

Several municipalities in the Ipswich-North Shore planning area will be able to maintain their existing wastewater treatment facilities as they are:

14. **Continue to serve North Andover by the Greater Lawrence Sewer District.** **This district will continue to discharge secondary effluent to the Merrimack River.**

15. **Continue Metropolitan Sewer District service in Winthrop, Reading, Revere, and Wakefield.**

16. **Maintain existing secondary treatment facility in Manchester.** **Manchester will maintain its existing secondary treatment facility with ocean discharge.**

Boxford, Wenham, and Rowley, through judicious implementation of the land use recommendation calling for location of development on C, F, and G category lands *(Chapter 3 of this and the Regional Report)*, will not need sewer service prior to 1990. When the need arises, Boxford and Wenham could be served by the Hamilton facility, and Rowley by the Ipswich facility.

Implications

Preliminary cost estimates for major interceptors and treatment facilities are: Gloucester $8,000,000; Essex – $1,200,000; Nahant $2,000,000; Swampscott – $3,000,000; Saugus $9,500,000; Marblehead – $7,000,000; Danvers $2,500,000; Salem $5,750,000; Beverly $3,500,000; Hamilton $3,000,000; Topsfield $2,200,000; Middleton $1,900,000; North Reading $9,400,000; Peabody $23,000,000; Ipswich– $2,700,00; Lynnfield $4,700,000; Newburyport– $1,100,000; Newbury $2,000,000; Groveland– $1,200,000. The most costly estimates are for those towns in which construction of advanced treatment facilities with discharges to the Ipswich River has been suggested. However, the less expensive alternative, connection to the South Essex Sewer District, would lower summer flows in the river to a point where water quality, recreation, and water supply would all suffer. The costs presented are for projects eligible for 90 percent funding (75 percent federal and 15 percent state) community costs would be one-tenth of the costs presented.

CHAPTER 6 OUTDOOR RECREATION

The Ipswich-North Shore planning area is often regarded as the greater Boston metropolitan area's playground. About three-quarters of the total area (about 188,000 acres) is undeveloped forest, field, wetland, or open water. Nestled amidst inland resources are numerous public outdoor recreational facilities – at least three state forests, several wetland/wildlife refuges, and several municipal parks and reservations. Altogether, publicly or semi-publicly owned land accessible for outdoor recreation amounts to 23,000 acres or 8 percent of the total planning area. The carpets of estuaries, beaches, bluffs, and harbors interspersed along the coast also provide a mixture of opportunities for swimming, boating, shellfishing, salt water fishing, waterfowl hunting, and nature study.

The recreational opportunities are as varied as the water and related land resources. Swimming, boating, and shellfishing are perhaps the most popular activities. Camping and picnicking facilities support tourists. Extensive outdoor recreation (hiking, nature study), hunting, and fresh water fishing are common activities among the less densely settled habitats.

The Ipswich-North Shore planning area embraces a portion of the greater Boston metropolitan area, including numerous towns undergoing rapid rates of urban growth. However, unsatisfied demands from core cities such as Cambridge and Somerville, also spill over into the Ipswich planning area. Tourism is a third source of demand for the water and related land resources. Over the years the combination of all three will increasingly exceed the capacities of the existing public recreational opportunities, thereby degrading the quality of the recreational experience.

The following discussion recommends ways to satisfy future recreational demands. The two main benefits to the planning area of these actions are financial boosts to the tourist sector of the economy, and environmental protection for the planning area's high quality of life.

SWIMMING

The Situation

The North Shore's coastal resources probably have the greatest potential for recreational development of all the water and related land resources north of Boston. The 130 mile coastline of this area has long stretches of estuaries, beaches, and rocky headlands interspersed with scenic harbors and villages. The North Shore area provides a significant opportunity to satisfy a large portion of both in-basin and out-of-basin salt water swimming needs.

Thirty-five beaches occupy 25 miles of the North Shore's 130 mile coast. The majority of usable North Shore beaches – about 105 acres – are publicly accessible to anyone from anywhere. The remaining beaches are unusable because of inaccessibility, rock outcrops, lack of facilities, or the presence of large stones or boulders.

The intensity of beach use varies from one part of the coast to the other. The more popular beaches such as Revere Beach, Lynn Beach, and Winthrop Beach are overcrowded on especially warm days, particularly on the weekends. Many of the other beaches such as Wingaersheek, Crane, or Plum Island, are inaccessible to most metropolitan residents; several facilities would in any case be inadequate to handle the crowds from the Boston area unless entrance roads, parking areas, bathhouses, and rest rooms are expanded.

By 1990 the amount of beach area required to satisfy beach needs will, at a minimum, be half again the existing publicly accessible area. Satisfying these demands by setting aside 50 acres of beach for public use is not a simple matter. Another approach is expanding facilities at underutilized beaches and improving public transportation to those less accessible beaches.

As pointed out in *Chapter 6 of the Regional Report*, problems related to satisfying swimming needs involve: inadequate access; inadequate parking, transportation, and toilet facilities at existing beaches; and erosion of beach areas caused by human misuse and natural forces. Much of the North Shore's privately owned beach-front is casually used by the public. This circumstance, while adequate for local needs, is inefficient for satisfying the beach needs of the entire planning area in the long-run.

Massachusetts residents do not have a "free" right of access along the foreshore. This was confirmed in July, 1974, when the Massachusetts Supreme Judicial Court ruled unconstitutional proposed legislation to codify a general public right to the foreshore (H. B. No. 6438). The public has limited rights, dating to Colonial times, with respect to "angling" and "fowling" and navigation uses, but these need clarification in modern terms.

A Special Legislative Commission on Availability and Accessibility of Public Beaches is continuing to consider alternative ways of opening more Massachusetts beaches to the public. A current report suggests three kinds of action: equalizing parking fees at town beaches for residents and non-residents; requiring

non-profit organizations holding tax-exempt status to permit public access to beach property; and automatically opening beaches and property that remain unposted and open to the public for over five years under a right of way dedication statute. There are serious problems with each of these actions; for example, the "dedication to public use" provision might well stimulate private property owners to close beach access presently unofficially open to the public to prevent loss of the private status.

The Solutions

Because of the expected doubling of swimming demands in the North Shore area, the pressures for public access to the shoreline will mount over the next 20 years. Three options for satisfying future beach needs were evaluated in *Chapter 6 of the SENE Regional Report,* some of them with stronger economic implications than environmental, and, conversely, others with stronger environmental implications. The following recommendations represent a balance between the two extremes. They ensure high quality beach bathing experiences, nearly adequate to satisfy 1990 needs, but are also the most cost-efficient.

The SENE Study encourages the Commonwealth to:

1. **Secure public access to the shoreline. The Commonwealth should continue, as a matter of policy, efforts to secure public access to the coastal shoreline, with careful regard for the protection of fragile ecosystems and for minimizing negative impacts on affected communities and individuals. In view of severely limited public access rights to the foreshore, the Commonwealth should pursue an implementable clarification of the angling-fowling-navigation rights granted in Colonial times. The Commonwealth should also consider possibilities of various means of state sharing of costs of access, traffic control, facility development, and maintenance and operation in return for general public access to Town beaches. User fees should be carefully addressed as a means of direct beneficiaries bearing a portion of the cost, including use on the basis of such fees. The Commonwealth should also continue to explore other alternatives for legislation and programs to improve public access to the foreshore generally.**

2. **Continue to investiagte best methods to widen and protect Revere Beach. The Metropolitan District Commission should continue to look into the possibility of enlarging, protecting, and improving Revere Beach.**

Another area of concern to local authorities is Winthrop Beach where there are serious erosion and shoaling problems. MDC should identify the best means of solving this problem to ensure that local beach needs are met.

No matter where the public beaches are located, people need transportation to get to them. The actions recommended above are incomplete without efforts to:

3. **Expand or improve public transportation to North Shore beaches. The MBTA should improve rapid transit facilities and bus service to Revere, Winthrop, and Lynn beaches, and initiate express bus service from metropolitan Boston to Wingaersheek, Crane, and Plum Island beaches.**

In addition, the Massachusetts Department of Transportation should investigate parking lots at appropriate interchanges along Route 1 with shuttle service to popular beaches.

Another important element in a strategy to satisfy beach needs is deflecting pressure on regional beaches by providing opportunities close to home. Yet due to shoreline physiography along the North Shore, the number of beaches is limited. Swampscott and Beverly have two attractive opportunities. The SENE Study encourages these municipalities to:

4. **Acquire Phillip's Beach (in Swampscott) and West Beach (in Beverly) for use by local residents.**

Implications

Although these actions are not enough by themselves to satisfy all swimming demands from the Ipswich-North Shore and some from the metropolitan Boston area, they are attempts to make more efficient use of existing facilities and provide better access to outlying beaches. They will open an additional 10 acres of local swimming opportunities, and create as much as 30 acres of beach immediately accessible to urban areas, and make available 60 acres of extensive coastal beaches for use by the metropolitan resident. The beaches proposed to be serviced by mass transit could accommodate up to 90,000 people, assuming a density of 50 square feet of beach per person, while remaining beaches could serve an additional 30,500 swimmers. Total costs are estimated to exceed several million dollars for the combined actions.

RECREATIONAL BOATING

The Situation

The 130 mile long coastline of the Ipswich-North Shore area is indented by 20 significant harbors or waterways, and by an additional 50 smaller coves or inlets. Two large recreational harbors (Marblehead Harbor and Gloucester Harbor-Annisquam River), and numerous smaller recreational harbors, are heavily used in this area. Approximately 10,700 recreational boats are based in the area, excluding trailered boats which were not included in the boating analysis. There are 43 boat landing ramps in various states of repair and usefulness. The North Shore fleet comprises nearly 22 percent of the recreational boats based in the SENE tidal waterways. Greatest pressures for boating facilities will occur in the coastal towns of Marblehead (already congested), Beverly, Salem, Manchester, Winthrop, and the Danvers River area, and in the commercial harbors (used mainly for petroleum and fish) in Beverly and Salem, Gloucester, and Lynn. The need for expanding these harbor facilities stems from unmet development pressures emanating from the Boston metropolitan cities. Some U. S. Army Corps of Engineers projections indicate that as many as 3,500 additional boat spaces might be needed by 1990.

The Solutions

Chapter 6 in the Regional Report evaluates three options for satisfying recreational boating demands. Some of them stress stimulating a tourist economy at the expense of commercializing the coastal environment. This option means developing numerous new harbors. Other options stress less intensive development of boating facilities without satisfying the demands. The recommended approach incorporates elements of both extremes.

Highest priority in this planning area is suggested for maximizing the use of existing marina facilities. Admittedly, from past experience, depending on any private recreational entrepreneur is risky due to the unavailability of funds to get the business going, and high risks of failure once underway. Also, to the detriment of Critical Environmental Areas *(see Chapter 3 of this report)* and to local environmental quality, traditionally, not much forethought has been given to suitable locations for development. To improve on these past shortcomings, the SENE Study recommended that the Massachusetts Department of Environmental Management and the Department of Fisheries, Wildlife and Recreational Vehicles, and private marina developers, form a committee. To achieve the goal mentioned above, the committee could guarantee loans for recreational entrepreneurs, plan for, and suggest suitable locations for development, and prepare developmental standards which towns could enforce through building standards and regulations which minimize disruption of aquatic dynamics and nearby Critical Environmental Areas.

A boating sub-committee could then advise private marina developers in the Ipswich-North Shore planning area to:

5. **Encourage orderly boating growth in at least 5 municipalities. The proposed state boating advisory committee *(see Chapter 6 of the Regional Report)* should supervise and coordinate the orderly growth of the boating industry and related facilities, in a wise and environmentally sensitive manner, especially in Newburyport, Gloucester, Beverly, Salem, and Marblehead.**

6. **Guide future development in at least 15 marinas. The proposed state boating advisory committee should plan and foster the orderly expansion of marinas in Newburyport, Winthrop, Lynn, Gloucester, Manchester, Marblehead, Salem, Beverly Harbors, and Pines, Danvers, Porter, Bass, Essex, and Annisquam Rivers, to accommodate as many boats as is feasible given local conditions.**

For existing marina facilities to be useful, they must be navigable. Therefore, the SENE Study recommends that the Corps of Engineers or Commonwealth:

7. **Maintain existing channels, if justified by favorable economic and environmental benefits. Areas under federal jurisdiction which may require maintenance are Salem, Beverly, Lynn, Newburyport, and Gloucester Harbors and Ipswich, Essex, and Annisquam Rivers. Areas under state jurisdiction which may require maintenance include Manchester and Winthrop Harbors and Bass, Danvers, Porter, Crane, and Saugus Rivers.**

Recreational facilities could be expanded at Collins Cove in Salem with more marina facilities and fore- and aft-moorings. Collins Cove is an 80 acre indentation at the south side of Beverly Harbor. The cove is located in the northeastern part of the City of Salem, which is part of an area having substantial unemployment. The cove appears to have potential for development of a 60 acre area which could have the potential for housing a minimum of 2,000 boats. The Waterfront Advisory Commission in the City of Salem supports the idea of dredging Collins Cove to create a 600 boat capacity marina area. However, because 74 acres of the area in question are prime shellfish habitat, close cooperation with U.S. Fish and Wildlife Service, National Marine Fisheries, and Massachusetts Division of Marine Fisheries is in order. Pressures for another conflicting use – increased petroleum related activities – are described in *Chapter 7 of this report.*

Channel and harbor maintenance poses the problem of disposal of dredged materials. The background and rec-

ommendations concerning this issue are discussed in *Chapter 7 of the Regional Report.*

Implications

These combined actions could provide as many as an additional 4,000 boating spaces by expanding existing or potential marinas, yacht clubs, town moorings, and docks, and by constructing the one regional recreational harbor facility. Because these actions would more than meet the in-basin and adjacent out-of-basin demands for boating opportunities (3,500 spaces), the area can continue to serve as a major source for satisfying regional boating needs. Because the recommended expansion has taken into account existing environmental and physiographic local constraints, impacts on coastal resources can be minimized with proper design and construction, while job opportunities would be maximized and local economies stimulated.

GENERAL OUTDOOR RECREATION

The Situation

This section considers the needs for parks, campsites, picnic facilities, and extensive outdoor recreation.

The Bureau of Outdoor Recreation (BOR) estimates that in the North Shore Area, the existing publicly accessible campsites would meet about a tenth of the 1990 demand for camping; the existing picnic facilities would meet about half the future demands for picnicking, and the publicly accessible natural areas would meet about half the 1990 demands for nature study, walking, and other forms of extensive outdoor recreation. Demands for the North Shore's resources from other parts of the SENE region are difficult to estimate, but undoubtedly the adjacent Boston metropolitan deficiencies in the SENE region *(see Chapter 6 of the Regional Report)* is the largest source of out-of-basin demands.

The Solutions

Alternatives for satisfying recreational demands in the Ipswich-North Shore planning area include acquiring large parcels of open spaces and unique natural sites; developing and/or expanding existing parks; and encouraging private recreational enterprise. The recreational demands were such that none of these alternatives was entirely eliminated. Parts, or all of each, are included in the recommended program. Complete development of all these alternatives could conceivably meet the basin, and a significant portion of the out-of-basin, demands. However, development of all of these alternatives to their fullest is not a feasible option. The recommended program is an attempt to balance the large scale needs with somewhat reasonable costs, to meet as great a magnitude and variety of recreation needs as is reasonable.

Chapter 6 of the SENE Study Regional Report explains that people in most parts of the U. S. drink water from rivers used for navigation or wastewater disposal, or from reservoirs used for navigation or recreation. Reservoirs in Massachusetts are for the most part used for a single purpose – the production of drinking water. While there are no state statutes prohibiting extensive outdoor recreation on reservoir lands, there is a law holding local water authorities legally responsible for drinking water contamination. For their own protection, trespassing on watershed lands is prohibited. However, evidence in the literature is growing that recreational use of reservoirs and related lands can have minimal impact on bacteria and virus counts. The regional recreation chapter therefore recommends that DEM working with the Department of Environmental Quality Engineering and local water authorities, should develop guidelines and regulations for extensive outdoor recreation on lands adjacent to storage (secondary) reservoirs. This framework would encourage water authorities to:

8. Develop guidelines for low intensity recreation on storage water supply reservoirs. Using guidelines described above, local water authorities should permit extensive outdoor recreation, on storage reservoir watershed lands throughout the planning area.

Acting now to protect natural resources for future recreational development complements the Study's recommendations concerning Critical Environmental Areas. Among the legislative channels for such an effort is the Massachusetts Scenic Rivers Legislation. This law enables the Commissioner of DEM to proclaim unique rivers as components of a scenic rivers system. Actions to alter streambanks of scenic rivers are restricted. The beauty of the Ipswich River is widely known, and to procure this natural resource for future canoeists and natural enthusiasts, the recommendation is to:

9. Designate the Ipswich River a component of the scenic rivers sytem. The Massachusetts Department of Environmental Management should implement existing state scenic rivers legislation and designate the Ipswich River as an initial component. The most suitable reach of the river is that from the most southwestern corner of Middleton to Ipswich. In addition to legislative protection, some picnicking, camping, and extensive recreation sites should be provided.

Beaches will remain major tourist attractions in future years and camping and picnicking facilities should be readily available accommodations. Ideally, these facilities should be as accessible as possible to coastal attractions. Trustees of Reservations and the communities of Rock-

port and Gloucester own substantial holdings within the vicinity of Ravenswood Park which could be consolidated and managed. The recommendation is for the State to:

10. **Acquire and develop 1000 acres near Ravenswood Park. The Department of Environmental Management should acquire nearly 1000 acres of a large natural area in the interior of Cape Ann for camping, picnicking, and extensive outdoor recreation. If acceptable, the state could manage adjacent private and municipal recreational lands, thereby substantially increasing available facilities.**

There are several opportunities for expanding or further developing existing recreational parks which are also quite accessible to the metropolitan area. The Study recommendations are:

11. **Develop trails and picnicking within Lynn Woods which are owned by the City.**

12. **Expand the Harold Parker State Forest. The Department of Environmental Management should expand the Harold Parker State Forest by acquiring 1800 acres in Middleton, Topsfield, North Andover, and along the Ipswich River to provide additional camping and picnicking facilities. These acquisitions are in addition to steps already being taken to acquire the abandoned Anti-Ballistic Missile site.**

13. **Expand Breakheart Reservation. MDC should expand Breakheart Reservation in Wakefield and Saugus by about 300 acres to provide picnicking and extensive outdoor recreation.**

Islands along the North Shore coast are special resources. Action is needed to:

14. **Acquire islands along the North Shore coast. The Department of Environmental Management and private groups such as the Trustees of Reservations should acquire uninhabited islands (Kettle, Graves, Milk, Salt, House) along the North Shore for recreational use. The islands would be expensive for the amount of needs they would meet and for their accessibility to the general populace. Thus, this recommendation should receive low priority.**

Plate 1 shows the location of Category A and B resources, which, as *Chapter 3* explains, have certain critical roles such as riverine and coastal flooding and erosion protection, water supply, and wildlife production. These areas require protection, and can also be used for varying degrees of recreation. Since protection and development of such resources is best coordinated at the local level, the SENE Study recommends:

15. **Use the SENE Development Capabilities Maps for open space and greenbelt programs. Municipalities should use SENE Development Capabilities Maps to begin more detailed efforts on open space protection and greenbelt programs. Methods for protecting Critical Environmental Areas, without outright acquisition are described in *Chapter 3 of the SENE Study Regional Report.***

Implications

Altogether these actions would nearly double the amount of facilities for camping and picnicking and acreages available for extensive recreational pursuits.

These recommendations stress increasing recreational opportunities by increasing the amount of natural area available for outdoor recreation, instead of intensifying the use of existing areas (often lowering the quality of the experience and increasing the environmental impacts) or acquiring public access to privately owned lands. The large amount of unsatisfied camping demands should be met by private development or by out-of-basin resources. Local action to protect wetlands and open spaces will also be required to meet demands for extensive outdoor recreation. These recommendations reflect the preferences of Ipswich-North Shore Basin Advisory Committee participants to expand existing facilities instead of intensifying use of them.

The state has a large responsibility in meeting the planning area's future recreational needs which are of financial magnitude beyond the means of most municipalities. The highest priority recommendations for the planning area stress acquisition of new recreation resources which are readily accessible from the metropolitan Boston area. This priority reflects local preferences as expressed in a series of public workshops to acquire new natural areas for open space protection, and is consistent with the recommended policy of the Massachusetts State Comprehensive Outdoor Recreation Report, MAPC Open Space Plan, and the SENE Study Regional Report that emphasis be placed on satisfaction of urban demands. The planning area's residents also profit by the recommendations because resources contributing to a much cherished quality of life are protected.

WILDLIFE AND FRESH WATER FISHERIES

The Situation

It is estimated that by 1990, residents of the Ipswich North Shore Area will spend 470,000 and 1,370,000 recreational days respectively, on hunting and fresh water fishing. Currently demand for the opportunity to enjoy fish and wildlife resources exceeds supply. Presently, only about 12,000 acres of public and 78,000 acres of privately owned lands (about one-third of the total wildlife habitat within the planning area) are open to hunting. If these same lands remained open and unchanged through 1990, they would support about 9 percent of the projected hunting demands. Insufficient fish and wildlife habitat, both in extent and variety, and a general lack of public access to the existing resource base, are the major factors limiting fulfillment of demand.

Of the 78 (4,025 acres) fresh water ponds, ten acres and larger, within the basin boundary, only 9 (490 acres) have guaranteed statewide public access; 12 (859 acres) have town or municipal access; 38 (1,367 acres) have informal access; 15 (1,196 acres) are public water supply reservoirs closed to fishing and 4 (113 acres) are private and in general closed to public fishing. Of the 132 miles of streams, the amount in public ownership and open to fishing is negligible. The vast majority of the Ipswich-North Shore stream banks are privately owned and closed to the general public.

The Solutions

Several measures for improving opportunities for fish and wildlife enjoyment were considered. They included: (a) acquire wetlands, (b) acquire upland wildlife management areas, (c) provide public access to privately owned wildlife habitat, (d) use of wetland legislation to preserve these fragile ecosystems, (e) acquire access to ponds, and (f) acquire stream bank access. Public access to water supply reservoirs, important for improving hunting and fishing, is also recommended in the section of this Chapter covering extensive recreation.

The option of acquiring access to the 54,000 acres of upland wildlife habitat privately owned and presently closed to hunting has been rejected. This solution was not recommended, first, because of the expense involved, second, because hunting is prohibited in several towns, and third, because public preferences expressed at the Ipswich-North Shore public workshop did not support the idea of public access to privately-owned land for hunting.

Due to multiple benefits of wetlands, including flood reduction and wildlife production, the Study has recommended protection of them to the maximum extent. This could be done without impairment to economic growth *(see Chapter 3 of the Regional Report).* The Wetlands Protection Act gives municipalities a substantial amount of authority in deciding whether or not alterations of wetlands should be permitted, but often their efforts are frustrated by inadequate knowledge or expertise. Recently, the Soil Conservation Service has developed a program whereby communities can get technical information about wetlands (and other natural resources) through the Conservation District Offices. Because, municipalities can protect significant amounts of wetlands through legislative channels, they should:

16. **Use the Natural Resources Planning Program to enforce wetlands legislation. Municipalities should use technical information provided by Natural Resources Planning Program, administered through Conservation District Offices to enforce the existing wetlands legislation.**

Outright acquisition is the safest assurance that wildlife habitats will be protected, and the state's responsibilities are to purchase those areas of regional significance *(Chapter 8, SENE Study Regional Report).* However, smaller wetlands, and adjacent or separate uplands, are often the most productive ones, and frequently towns prefer to control them. The SENE Study recommendation is:

17. **Use Self-Help Funds to acquire significant wetlands. Communities, using Self-Help Funds from the Department of Fisheries, Wildlife, and Recreational Vehicles, and/or private interests, should acquire wetlands most important for wildlife production** *(identified in SENE Study single-purpose inventory attainable in the NERBC files)* **throughout the planning area.**

In addition the SENE Regional Report has recommended public acquisition of several thousand acres of prime wildlife habitat in Newbury near the Parker-Little River area, and in Groveland near the Northeast and Crane's Pond Management Areas. These areas are believed by state and federal officials to be of great value for both hunters and wildlife enthusiasts.

Productive fresh water fisheries persist in the planning area's ponds, lakes, and streams. The Massachusetts Division of Fisheries and Game has an active program of streambank acquisition, and the Public Access Board is legally charged to acquire public access to "great ponds",

(those natural ponds 20 acres and larger) for fishing, and those natural ponds 10 acres and larger for other recreational purposes. Public water supply reservoirs, previously discussed in this chapter, are also productive fishery habitats. To ensure the availability of fresh water fisheries for future generations, the Study recommends:

18. **Change Great Ponds legislation for fishing ponds. The Massachusetts legislature should change the existing Great Ponds Act to designate ponds 10 acres and larger "great ponds" for fishing.**

19. **Acquire public access to 41 ponds. The Massachusetts Department of Fisheries, Wildlife, and Recreational Vehicles should evaluate 41 ponds 20 acres or larger of "good" or "best" fishing potential and recommend those to which the Public Access Board should acquire access. The suggested ponds are listed in *SENE Study single-purpose inventory information* available in *NERBC files.***

20. **Acquire public access to 15 streams. The Massachusetts Department of Fisheries, Wildlife, and Recreational Vehicles should recommend to the Public Access Board which streams in the Ipswich-North Shore planning area have good-best fishing potential and are undeveloped. Assuming adequate public access and fisheries management, the following 15 streams could provide over 80,000 man-days of fishing per year. These streams (from SENE Study single-purpose inventory) are: Parker River, Newbury; Little River, Newbury; Mill River, Newbury; Penn Brook, Georgetown; Ipswich River, Ipswich; Howlett Brook, Ipswich; Pye Brook, Topsfield; Salem-Beverly Canal, Topsfield; First Brook, Boxford-Topsfield; Boston Brook, Middleton; Marthins Brook, North Reading; Skug River, North Reading; Lubber Brook, Wilmington; Maple Meadow Brook, Wilmington; Saugus River, Lynn-Saugus.**

The SENE Regional Report has also recommended the acquisition of fishing access at several points along the Ipswich River, believed by state and federal authorities to be highly productive for fresh water fisheries.

Implications

These recommendations would help to meet about 14 percent of the future demands for hunting and would greatly improve the protection and quality of wildlife habitat. Remaining demands will have to be met in other parts of, or outside of, the SENE region.

These actions substantially improve the amount of fresh water fishing opportunities in the planning area, and also help to accomplish one of the SENE Study's main aims, the protection of wetlands and other Critical Environmental Areas.

CHAPTER 7 MARINE MANAGEMENT

The major marine related issues in the Ipswich-North Shore planning area concern offshore fisheries, shellfish and aquaculture, and commercial navigation needs. Although discussion in this Planning Area Report will deal only with these topics, information on other marine related subjects can be found in the *SENE Regional Report, Chapter 7, Marine Management.* That chapter covers offshore fisheries, shellfish and aquaculture, port development, dredged materials disposal, offshore sand and gravel, and urban waterfronts. A separate SENE Study report, "Urban Waters Special Study", deals specifically with the City of Gloucester and is available from NERBC.

Additional marine related topics, such as recreational boating, beach swimming, coastal access, and salt water sportfishing can be found in *Chapter 6 of this Planning Area Report or the Regional Report.* Similarly, discussions on power plant siting, including coastal implications for tank farms and a specific evaluation of Massport's proposed Newburyport site, are found in *Chapter 9, Locating Key Facilities, of this Planning Area Report or in the Regional Report.*

OFFSHORE FISHERIES

The Situation

The fishing industry at Gloucester is a major economic component of the Ipswich-North Shore planning area. Through its fishing capabilities it brings in large sums of revenue and has provided 21 percent of the total work force in the city in 1972. Although exact data are not available on the earnings of fishermen and plant workers (both imported and domestic products), it is estimated that the total direct earning to labor in the fishing industry was over $20 million dollars in 1972.

The fishing fleet in Gloucester is primarily geared to taking high volume species such as ocean perch, silver hake, and sea herring, which are processed locally. The port also handles groundfish (cod, haddock, flounders, etc.) and lobsters. The harvest is used in the local fresh fish market, although excesses are shipped to Boston, New York, and Philadelphia markets.

The Gloucester fleet is composed of offshore and near-shore fishing segments. The offshore fleet is comprised of 10 to 20 vessels which fish Georges and Browns Banks, and various other areas from 50 to 200 miles offshore. These vessels principally land the higher priced groundfish, and occasionally, whiting and ocean perch.

The near-shore fleet is a potpourri of vessels, most of which fish well within 50 miles of shore. Approximately 60 to 65 small trawlers are included in this segment. The Gloucester market attracts additional small draggers from nearby Marblehead and Newburyport. Operating on a seasonal basis the near-shore fleet concentrates its efforts on ocean perch and shrimp (winter-early spring), whiting (spring-summer), and sea herring (summer).

Another facet of the near-shore fleet is composed of a sizeable (and increasing) group of gill netters and line trawlers. These boats usually fish for cod, cusk, haddock, and pollock. Increased activity in this segment of the Gloucester fishery is occuring because gill nets and line trawls are capable of working in areas with bottoms too rough for larger draggers. This method of fishing is relatively inexpensive. A small near-shore vessel costs $25,000 – $60,000 as opposed to large trawlers which may cost as much as $ 500,000.

The problems facing the Gloucester fishing fleet are the same as those facing the entire New England fishing industry: old vessels; increased costs of equipment, insurance, capital, and labor; a deficiency of new people entering the fishery; competition from substantial landings of frozen fish by foreign vessels.

The decade of the 60's saw a continuing decline in landings of fresh fish at the port of Gloucester, falling from the ten year high of 192 million pounds in 1960 to a low of 69 million pounds in 1969. Since then, the industry has enjoyed three successive years of increased landings and prosperity. Total landings increased 32 percent in 1970, and 1972 landings are as much as 62 percent higher than in 1969. The darkest year in the decade was experienced in 1967 when the value of landings fell to a low of slightly more than $5 million, down nearly $2.5 million from the previous year. By 1970 landings were valued at over $8 million and by 1972 the value of landings had increased to an estimated record $9.6 million.

It is to the credit of the industry in Gloucester that in the face of declining stocks of traditional species, it has developed new fisheries for such species as herring, shrimp, and offshore lobster. But despite the fine performance of the fleet in recovering from the 1967 decline, the real test of its adaptability and willingness to diversify lies in the years immediately ahead. Unless the fleet maintains the capability and willingness to remain short-term and flexible, the possibility of a decline, such as that experienced in 1967, is always very real. In part, the ability of the fleet to remain depends upon the willingness of the industry to actively seek or develop markets for new species and products to supplement those of the more traditional species.

The Solutions

In light of the preceding discussion of the situation and opportunities facing the fishing industry, the following actions are recommended, consistent with the SENE Regional Report:

1. **Continue to support an interim offshore 200-mile economic zone.** **Local fishermen and politicians should continue to urge the U. S. Congress to extend, as soon as possible, the nation's jurisdiction over fisheries to 200-miles offshore or to the edge of the continental shelf.**

This recommendation would provide better control over the offshore resource base as an interim measure pending final proposals by the Law of the Sea Conference.

2. **Support national fisheries management policy.** **A national management policy should be locally supported by the fishing industry. The establishment of this joint federal-state management program would allow limited foreign entry, quota reinforcment, seasonal or species control limitations, and fishing gear specifications within the 200-mile economic zone.**

The objective of the preceding actions would be to increase the supply and variety of fishery products without depleting stocks of any given species.

3. **Improve market for underutilized fish species.** **The local commercial fishing industry, with technical assistance from National Marine Fisheries Services (NMFS) under the New England Fisheries Development Program, should actively develop a domestic market for underutilized fish species by applying innovative marketing techniques in educating the public to the use of new fish stocks.**

4. **Accommodate coastal fish facilities through improved planning.** **The state Coastal Zone Management Program in cooperation with Department of Community Affairs, should develop guidelines and provide technical assistance to local planning boards. Such assistance should be provided when making land use or zoning bylaws for shore-based support services for commercial fisheries, such as fish or shellfish processing plants, or updated docking and transshipment facilities. Such planning should also carefully consider Critical Environmental Areas (shown on the Development Capabilities Map, Plate 1) so as to protect those estuarine resources which are of vital importance to the commercially valuable offshore fisheries.**

5. **Allow privately financed purchase of foreign-built fishing boats.** **Local fishing industry should urge repeal of the law prohibiting the purchase and importation of foreign-built vessels to allow their use specifically in depressed fisheries states, if purchased with private capital. Federal monies should not be granted for purchase of such foreign vessels.**

SHELLFISH

The Situation

Historically, shellfish are very important in the coastal area north of Cape Ann in the many shallow coves and bays. The most important shellfish areas are in Newbury, Ipswich, Essex, and Gloucester with a combined total of 2054 acres of productive shellfish beds producing an annual crop worth about $1.7 million. In the North Shore area as a whole, there are approximately 2,700 acres of productive clam flats capable of producing an annual crop of 250,000 bushels of clams. At today's prices, this annual crop is worth an estimated $4.5 million.

Aside from the "red tides" of pathogenic algae, estuarine pollution is the biggest problem at this time. Current state health regulations have closed or restricted more than 1,350 acres of shellfish beds (capable of producing approximately 100 bushels of legal clams/acre/year) due to municipal, industrial, or private discharges.

However, construction of updated and improved wastewater treatment facilities *(see Chapter 5 of this planning report)* will improve the existing situation. Dredging and filling have also destroyed clam beds in Gloucester, Newbury, Revere, Salem, and Saugus.

A second problem is inconsistent management practices. Management of the shellfish is currently the responsibility of the individual towns. Because those towns with larger clam flats receive more revenue from shellfish licensing, they can afford more conscientious management practices than those with smaller shellfish beds. This causes inconsistency and fragmentation to develop between towns in terms of degree, and effectiveness, of shellfish management. In some cases, where towns cannot afford to hire trained personnel for the job, mismanagement and underutilization result.

Management of the resource might be more efficient if the Division of Marine Fisheries were provided with more personnel to provide technical assistance to these towns.

Although the existing shellfish resources are sufficient to meet recreational demands through 1990, it is necessary to import shellfish to service restaurants for the commercial trade. With its extensive estuarine habitats, there should be greater emphasis placed upon commercial shellfish production in the estuaries of the planning area.

Research on marine aquaculture has shown that preference should be placed on sites located in protected areas. Extensive culture operations require large areas for ponds, whereas, intensive culture requires dense propagation per unit area. Because the availability of suitable coastal areas on the North Shore is limited to protected embayments, it would appear that intensive culture would be in order. However, marine fisheries experts ruled out the two likely areas (Plum Island Sound and Essex Bay) because of conflicts with recreation.

The Solutions

The following actions are recommended in order of priority:

6. **Increase state's technical assistance for local shellfish management. Present local management of shellfish resources should be strengthened by funding the Massachusetts Division of Marine Fisheries to provide increased technical assistance and coordinated management practices to the towns.**

7. **Fund state to assist towns having aquaculture potential. The State Division of Marine Fisheries should be funded to take a more active role in providing technical assistance to communities in locating suitable aquaculture sites and evaluating private corporations for necessary technical and administrative qualifications prior to granting aquacultural licenses.**

8. **Give priority to new treatment plants with deep-ocean outfalls. The Water Quality Branch of EPA in conjunction with the Massachusetts Division of Water Pollution Control should give high priority to the construction of coastal wastewater treatment facilities, such as the Essex River Advanced Wastewater Treatment Facility, with deep-ocean outfalls.**

9. **Research removal of virus and bacteria from wastewater to reduce shellfish health hazards. EPA should increase funding of research into the removal of viral contaminants from treated wastewater so as to allow potential use of treated effluents for shellfish propagation** *(see Chapter 7 of the Regional Report).*

COMMERCIAL NAVIGATION

The Situation

The three largest commercial ports in the Ipswich-North Shore planning area are Salem Harbor, Gloucester, and Beverly Harbor. Salem and Beverly are almost exclusively oil-handling ports for local power plants, while Gloucester is New England's leading fishing port.

Salem Harbor, the largest North Shore port, is served principally by the Salem Terminal Corporation Wharf owned by the New England Power Company. Approximately eighty percent of receipts consist of residual fuel oil, mostly imported, that is used to supply the recently enlarged Salem Harbor power plant. Most of the remaining receipts consist of heating oils, which are stored mainly in tanks leased from the power company. Most of the tankers calling at Salem Harbor draw 32 to 37 feet and require a high tide to navigate the 32-foot deep channel. Planning is now in progress for the addition of a fifth power generating unit, and for consideration of additional terminal and storage facilities.

There are no immediate plans concerning possible deepening of the channel. In the event that a federal study is requested at a future date, ledge areas would economically prohibit any deepening of the channel beyond the range of 40 to 45 feet, and possibly a lesser depth. Although an additional terminal for the receipt of gasoline and other petroleum products could be developed at the south side of the Coast Guard Air Station or Fort Pickering on Winter Island, the availability of land needed for additional storage tanks would be a major deterrent to expansion of the harbor to also serve as a gasoline receiving port. The lack of available land for the provision of additional storage tanks would entail such drastic measures as filling in Cat Cove, which now houses a marine research station operated by the Massachusetts Division of Marine Fisheries, and filling in Collins Cove (off Beverly Harbor) which should be considered for a regional recreational harbor *(see Chapter 6).* In view of the major dislocations and environmental losses entailed, a regional offshore terminal and pipeline distribution alternative to this area is discussed in *Chapters 7 and 9 of the Regional Report.*

At **Beverly Harbor,** the 24-foot deep channel is adequate for the main receiver at Beverly, a chemical firm based at Tuck Point. The Beverly Harbor channel is used also by

13-foot draft tankers that pass through Beverly Harbor enroute to a fuel oil distributor at Danversport, at the junction of the Waters and Danvers Rivers about two miles upstream from the head of Beverly Harbor. These tankers must wait for a rising tide because the low water depth is only 8 feet in the Danvers River and the 9-foot tidal range is needed to permit small coastal tankers to reach the Danversport terminal. No federal study has ever been made concerning the economic justification for channel dredging in this area. Because such work, if justified, would benefit a single user, federal regulations would require that 50 percent of the first cost be borne by the single user or by non-federal funds.

At **Gloucester Harbor**, the existing 20-foot deep channel is used by foreign freighters for the importation of frozen fish, by the local fishing fleet for the receipt of fresh fish and shellfish, and by small coastal vessels for the receipt of fuel oil. The several local fuel oil distributors all have limited storage capacity, and their service area is small, principally the Cape Ann and Ipswich Bay coastal areas. City officials have recently requested a study to determine the justification for deepening the channel to 25 feet, in order to accommodate the increasing number of foreign vessels that are landing frozen fish at Gloucester. The need for a federal study is now being reviewed.

The primary problem for commercial fishing boats is not the need for harbor improvements, but rather the need for conservation measures in the offshore fishing grounds. The North Shore fishing fleet has declined sharply in recent years because the offshore fishing grounds have been overfished by foreign fishing fleets, and because most of the American fishing boats are relatively old and are unable to compete on equal terms. The need for, and implementation of, a 200-mile territorial limit for foreign fishing boats (the existing limit is 12 miles) is discussed in *Chapter 7 of the SENE Study Regional Report.*

The Solutions

Given the preceding discussion, the following actions are recommended:

10. **Conform with regional port development study findings. Further work on channel maintenance dredging or deepening in Salem should be considered in conjunction with the proposed regional port development study** *(see Chapter 7, Regional Report).*

11. **Consider deepening Gloucester channel. The Corps of Engineers should consider the feasibility of deepening the Gloucester channel to 25 feet to better serve the potentially larger fishing and fish-processing vessels proposed or currently active in offshore fisheries** *(see Chapter 7, Regional Report).*

URBAN WATERFRONTS

The Situation

New England's port cities were largely responsible for the area's rapid economic growth and development in the eighteenth and nineteeth centuries. As noted in New York's "Waterfront Workshop" conducted by the City's Planning Commission in 1974:

> "Time and technology have left stranded many once-busy segments of the waterfront. Brickyards, stoneyards, lumberyards, and coal terminals have either gone out of business or moved elsewhere. Containerization has shifted the volume of shipping business, and airlines and cruises have transformed passenger ship piers.
>
> These changes have opened up the waterfront's potential, although in a double-edged fashion: because one type of development usually precludes all other alternatives, proposals may generate counter-proposals. A housing plan is met with the suggestion that a park would be preferable, a plan to site industry may arouse environmentalists, a plan to turn over an idle pier for recreation may be attacked as a blow to shipping. Almost everyone agrees that the shoreline is too valuable to be allowed to lie fallow, but agreement on a specific plan may be difficult to obtain. This is one of many contradictions enshrouding the waterfront."

In order to recapture the vitality which lies just beneath the surface of decay and neglect, a few institutional and administrative changes are needed, backed by public awareness. Several cities and towns have initiated or carried out sound programs for waterfront development or renewal, although their success has occurred in spite of, rather than because of, current institutional and public policy.

The Gloucester waterfront is used primarily for fishing operations, cold storage, oil firms, and freight services. There is also a state fish pier and some restaurants, but the predominant use is for fish processing with nineteen firms involved in the operations. About 18 percent of the total cold storage capacity in the United States is located in Gloucester. In recent years firms concerned with storing and processing frozen fish blocks produced 355 million pounds. Due to market and supply considerations, however, the future growth of this industry is in question (see preceding fisheries recommendations, or *Chapter 7 of the Regional Report).*

A recent MIT Sea Grant comprehensive report on Gloucester (Gloucester Resource Study. Project NG-43-72. Spring, 1973) has suggested that a key issue and major resource of the community is the waterfront area and its status. This report suggested that the major harbor use issues were:

(1) The cleanup of the Inner Harbor including the removal of dilapidated buildings and piers on the waterfront, as well as effective water pollution controls;

(2) The development of water oriented activities along the waterfront should be encouraged, and non-marine uses should be discouraged;

(3) The tourist industry should be encouraged by the development of a marine activity center which would include fish markets, restaurants, and small shops;

(4) The frozen fish industry should be evaluated for its role in the economy of the City and as a waterfront use; and

(5) As the City develops the waterfront as the focal point for the City, public access to the waterfront should be encouraged and provided for.

Recent trends in waterfront development include a possible motel development, a new Coast Guard station and two renewal projects that touch on the waterfront. There is also a third renewal area under the jurisdiction of the Housing Authority which is presently being used for ice houses and oil storage. This area might be developed in the future. The pattern has been to give fishing industry related activities priority in the urban renewal areas near the water.

Extensive urban renewal programs are underway in the Industrial Inner Harbor area. These programs have led to the removal of most of the decayed piers in the area. The State harbor debris removal program was utilized to remove a derelict vessel from the harbor shoreline.

Longer-term issues which will affect the waterfront include the impacts related to potential offshore oil exploration in the Georges Bank area, the future of the fishing industry, both fresh and frozen sectors, and the role of tourism and recreational development on the waterfront.

The Solutions

By integrating master planning and development control functions in urban waterfront areas, local government can focus public interest and concern on relevant development issues and establish administrative framework at the local level. In light of the previously discussed options, the following actions are recommended in order to enhance the reuse of urban waterfronts in a rational and balanced manner:

12. Coordinate local waterfront planning and development. **Municipalities should prepare and inventory or plan for the long-term use or reuse of waterfront areas. In undertaking such activities, towns should give special consideration to factors such as the protection of flood prone areas, the preservation and enhancement of historic sites and buildings, the provision of public access easements (both physical and visual) in new development, building height, and so forth, consistent with Critical Environmental Areas as specified in *Chapter 3, Guiding Growth.***

While primary responsibility for initiating and carrying out land use decisions should remain at the local level, the state should perform the following critical functions:

13. Provide guidance and set criteria for priority waterfront uses. **Massachusetts, through its Coastal Zone Management Program, should develop urban waterfront planning and management guidelines, and criteria for deciding priorities for uses to be incorporated into local waterfront master plans. Priorities should be established for water-dependent uses, water-using uses, complementary uses, and low priority uses.**

14. Review and coordinate waterfront use. **Massachusetts, through its regional planning agencies and Department of Community Affairs, should exercise its powers to review and revise major waterfront development proposals of more than local concern.**

15. Provide federal funding for state and local waterfront development plans. **The U. S. Congress and the Office of Management and Budget should approve ade-**

quate federal funding for state coastal zone planning programs, and for other planning programs which enhance waterfront development.

Implications

Implementation of coordinated local and state approaches to waterfront use should help to minimize fragmentation of decisions in waterfront areas while recognizing the appropriate roles of the different levels of government. Agreement on appropriate guidelines and priorities should help to reduce conflicts between uses, and increase the chances for a variety of uses along urban waterfronts. More sensitive and sensible use of waterfronts will reinforce use of existing infrastructure and help to reutilize urban areas which have considerable economic and aesthetic potential.

CHAPTER 8 FLOODING AND EROSION

Although there is extensive development along the banks of the principal rivers in the planning area, there is little history of floods causing major damage. Wetlands in the Ipswich-North Shore area play an important role in keeping down the extent and costs of floods. In fact, wetlands in this planning area represent a higher proportion of the total land area than any other, over 18 percent (nearly 48,000 acres of wetlands in 1970 as compared to a total land area of some 261,000 acres). Yet, the rate of wetlands destruction in the planning area is estimated by the Corps of Engineers at more than double the statewide average of 1 percent annually as determined in a 1967 study by the Massachusetts Department of Natural Resources (now the Department of Environmental Management). With increasing development in flood plain areas and loss of existing natural valley storage areas, flooding could become more frequent and more serious.

The Situation

Inland Flooding

The flood problem in the Ipswich-North Shore is similar to the difficulties being experienced in many communities with pressure for development. Residential and commercial development has occurred in natural valley storage areas and floodways vulnerable to flood inundation. Such development has increased runoff and accelerated the flood problem. Riverine flood plains total about 20,300 acres; fresh water wetlands total some 32,500 acres.

Riverbank flooding occurs nearly every year in the northern areas of the planning area. The rivers in this area, such as the Ipswich and Parker, are characterized by relatively flat profiles with extensive flood plains that are conducive to sluggish runoff. High flood levels on these streams usually result from storms producing large volumes of runoff rather than intense, short-duration rainfall. High water tables and flood damages have been experienced in the built-up areas of Wilmington, North Reading, West Peabody, and Ipswich.

The greatest flood of record for the Ipswich River occurred in March 1968, with a discharge of 2,680 cu. ft./sec. (cfs) at the Ipswich gage -- the average discharge is 198 cfs. A storm of this magnitude has a frequency of occurrence of approximately once in 50 years, or a 2 percent chance of occurrence in any one year. Damages produced by a storm equivalent to this one are estimated at approximately $300,000. Of these, over half would be sustained by industrial firms and the balance at various points throughout the watershed. The Corps of Engineers has identified two significant inland damage areas at industrial sites within the towns of Wilmington and Ipswich. (In the latter case, however, the industrial firm subject to the significant damages has plans to move outside the region.)

Wetlands in the **Ipswich River watershed** alone total 12,000 acres and help to restrain potentially damaging flood flows, although there are damages to development in flood plains, especially in Wilmington and Ipswich. One of the three largest natural valley storage complexes exists in parts of Reading, North Reading, and Lynnfield; a second in Topsfield, Hamilton, and Wenham; and a third along the upper Fish Brook in North Andover and Boxford; and upper Parker River in Groveland, Georgetown, and Boxford.

Headwater wetlands are controlling flood flows efficiently in the **Parker River watershed,** where urban development has consumed very few of the numerous small wetlands. Both large and small wetlands in the Ipswich and Parker watersheds present the opportunity to naturally regulate floods, and, at the same time, to provide productive wildlife habitats.

The total swamp and salt marsh area in the **Saugus River watershed** is about 3,100 acres, approximately 10 percent of the total watershed. Lynnfield and Wakefield in the Saugus basin have headwater wetlands important both for restraining potential flood flows downstream and for wildlife production. Yet there is a flooding problem in headwater tributaries and downstream in the Saugus mainstem.

Four floods of significant proportions have occurred on sections of the Saugus River and two of its tributaries - the Mill and the Pines Rivers - in recent years; 1936, 1955, 1962, and 1968, with the maximum flood of record resulting from the 1962 storm. A recurrence of the 1962 flood levels under 1972 conditions would cause losses estimated at approximately $200,000 on these streams. At a stage 2 feet higher than the 1962 flood event, the losses are estimated at $2.5 million with 75 percent of the loss occurring on the Saugus River (Saugus-Revere), 8 percent on Bennett's Pond Brook, and 17 percent on the Saugus River with serious flooding in Saugus and Revere due to wetland destruction in the headwaters, undersized stream channels, and development of areas exposed to major coastal storms. Extensive commercial development along U. S. Route 1 in the southern areas presents a high flood damage potential.

Coastal Flooding

Frequent tidal flooding occurs in the cities of Revere, Saugus, and Lynn, particularly during northeasters. These storms cause extremely high tides which inundate coastal lowlands and cause overtopping of seawalls. Two major storms in January 1961 and December 1969 caused extensive tidal flood damage along the North Shore estimated at $300,000 and $179,000, respectively. Coastal damage centers have been identified by the Corps of Engineers at the Ipswich estuary, Lynn Harbor–Saugus, and Revere. Approximate tidal flood areas for the planning area, based on a 100-year frequency storm, total 23,910 acres.

A hurricane survey report of Massachusetts coastal and tidal areas was published by the Corps of Engineers in 1964. Due to the scattered nature of developments and potential damages, complete hurricane flood protection was found to be impractical and uneconomical. The Division Engineer recommended that no further federal improvements for hurricane protection be undertaken in the Commonwealth at that time. However, the report was published recommending methods of tidal flood protection for local consideration including early warning, zoning, beach raising and widening, concrete walls, bulkheads, and revetments.

Coastal wetlands can serve as buffer zones against storm damages. Comprising some 15,200 acres, many of these wetlands have been mentioned in *Chapter 3 of this report* as unique natural areas. Extensive tidal marsh areas are located in Plum Island Sound, Essex Bay, the Annisquam River, and Saugus and Pines Rivers. In the southern Ipswich-North Shore planning area, almost all the coastal wetlands are surrounded by urban land uses and are threatened by encroaching development.

Particular emphasis should be given to protecting wetlands not already under public or semi-public ownership in municipalities subject to high or medium-high development pressure *(see Chapter 3, Guiding Growth, in this report).*

Upland Erosion

Soils in the Ipswich-North Shore planning area have a low erodibility factor in their present condition. But when these soils are disturbed or topsoil stripped, as is usual during construction, the erodibility factor is increased and is expected to range from medium to high. Erosion problems on forest land in the basin also stem from urbanization activities. Much of the erosion damages can be avoided through a sound urban-environmental forestry program to retain as much of the native vegetation as possible.

Coastal Erosion

The planning area also experiences continual coastal erosion, damage to public and private property, and wind erosion of the sand dunes. Critical erosion occurs particularly along the coastal beaches. Critical erosion of approximately 3 feet or more per year totals some 12,600 linear feet, and has been measured by the Corps in the municipalities of Newburyport (Plum Island Point, 2,000 feet); Newbury (Plum Island Beach, 5,300 feet); and Revere (Revere Beach, 5,300 feet). Non-critical erosion of less than 3 feet per year occurs along Plum Island Beach, Crane Beach, and Wingaersheek Beach.

A number of studies of beach erosion control have been undertaken by the U. S. Army Corps of Engineers in cooperation with, in some cases, the Commonwealth of Massachusetts: Plum Island Beach (action taken but subsequent severe erosion), Nahant Beach (authorized, but not funded), Revere Beach (some work done by the Commonwealth, but subsequent severe erosion), Revere and Nantasket Beaches (Nantasket Beach is discussed in the Boston Planning Area Report). The Revere Beach project has been authorized, but not fully funded – the estimated first cost of construction is $3.7 million, of which the federal share is estimated at $1.85 million.

The Solutions

A number of approaches and specific measures have been considered for alleviating flooding and erosion in both riverine and coastal areas. These have been discussed more fully in *Chapter 8 of the Regional Report.*

Recommendations

A major result of the SENE Study has been the classification of the region's resources according to their capability. Inland and coastal wetlands, estuaries, beaches, barrier beaches, and critical coastal erosion areas have been classified as Category A resources, requiring the greatest degree of protection from development. Flood plains and hazardous coastal flooding areas (both to the 100-year flood frequency line) have been classified as Category B resources or management areas which have very limited tolerance for development, but with proper management are suitable for such compatible activities as agriculture or recreation. In keeping with this resource classification, the recommendation is:

1. **Develop flood plain management programs which maximize non-structural measures.** **Comprehensive flood plain management programs should be developed for riverine and**

coastal flooding areas. Such programs should make use of non-structural solutions wherever possible.

All such programs should be developed in close cooperation between federal and state agencies, regional planning agencies, and local governments and interests. They should also be coordinated with related programs, such as the National Flood Insurance Program, state wetlands acts, state land use planning programs, and for coastal areas, with state coastal zone management programs. Section 73 of the Water Resources Development Act of 1974 authorizes federal cost sharing for non-structural measures. Although implementation of Section 73 has presently been deferred by the Office of Management and Budget, application of the cost sharing authority can be an important factor in making non-structural solutions more competitive than they have been.

Because many communities in the planning area have relatively low population densities in comparison with the rest of the SENE Study region, the opportunity exists for a program of natural valley storage protection such as that developed by the Corps of Engineers for the upper Charles River Basin, particularly for the Ipswich River. SENE Study results show no major flooding problems in the past, but increased runoff associated with increased urbanization and development in low lying areas is expected to cause much greater flood damage in the future. The SENE Study recommends that the Corps of Engineers:

2. **Undertake a comprehensive flood plain management study of the Ipswich River.** **As an example of the previous recommendation, the Corps of Engineers should undertake a comprehensive flood plain management study of the Ipswich River. The program should maximize opportunities for implementing non-structural solutions, and apply the guidelines for comprehensive flood plain management programs described in *Chapter 8 of the Regional Report.***

The study should consider non-structural flood management alternatives which could be implemented on a regional basis and specific local protection measures for areas where non-structural alternatives are not available. This study should be developed in close cooperation with state and local authorities, as well as with federal representatives for related programs particularly with HUD, EPA, BOR, F&WS, the National Weather Service, and the Civil Defense. Special reference should also be made to related studies such as the River Systems Study for the Ipswich by MAPC. The proposed study should also reflect new directions of Section 73 of the Water Resources Development Act of 1974 discussed in *Chapter 8 of the Regional Report.* The proposed flood plain management study is expected to cost a total of $175,000 and take about two years to complete.

Throughout the planning area,

3. **Adopt local flood plain zoning preventing adverse flood plain development.** **Municipalities should adopt flood plain zoning to prevent adverse development in flood prone areas (and particularly in the 100-year floodway) as defined under the National Flood Insurance Program.**

This also includes incorporating inland and coastal wetlands, eroding areas, and storms of record on the map upon which the zoning is based. All related regulations – building codes, subdivision regulations, sanitary codes – should reinforce this policy of preventing adverse development and redevelopment of the 100-year flood plain. This would include prohibiting rebuilding after storm damage such as along Plum Island Beach and behind Wingaersheek Beach. The regulations should also take advantage of the restrictive provisions of state wetlands regulations, and scenic rivers programs. Technical assistance should be provided to all officials responsible for enforcing the zoning and related regulations.

Related to local zoning action are two recommendations for controlling local sedimentation and inland erosion problems.

4. **Establish local sediment and erosion control ordinances.** **Municipalities, assisted by the U. S. Department of Agriculture and the Executive Office of Environmental Affairs, should establish local sediment and erosion control ordinances.**

A model for such ordinances is included in the more detailed information prepared for the Study. Assistance from the Soil Conservation Service, the Cooperative Extension Service, the State Executive Office of Environmental Affairs, and others is available to the cities and towns.

5. **Establish forest buffer zones.** **Municipalities should establish appropriate forest buffer zones within 200 feet of streams and lakes to preserve vegetation and maintain natural systems through forestry techniques to help keep non-point source pollutants from reaching sensitive water quality areas.**

Towns with existing high and medium-high development pressure *(see Chapter 3)* should be among the first to implement these two recommendations.

6. **Establish local regulations to strengthen flood plain management. Municipalities should ensure that all regulations including building and sanitary codes, reinforce the intent of the zoning districts and regulations recommended above.**

In conjunction with a flood plain zoning program:

7. **Acquire significant flood plains and wetlands. Municipalities and state agencies should investigate continuing possibilities to acquire those wetlands and flood plain areas most significant for flood damage reduction and protection, and which have water supply, wildlife, and/or recreation values.**

Particular emphasis should be given to protection of areas classified as unique natural areas and those located in areas subject to high and medium-high development pressure.

Wetlands protection is an important element of reducing future flood flows and damage for the planning area. *Chapter 8 in the Regional Report* contains a number of recommendations to strengthen the legal and administrative basis for action in Massachusetts. Specific inland areas for protection could include the following towns experiencing high and medium-high development pressure:

- Wetlands in Boxford, Georgetown, and Groveland at the headwaters of the Parker River, now effectively reducing potential downstream damages;
- Lynnfield, Reading, and Wakefield where wetlands protection is especially important for keeping down potential increases in downstream flooding;
- Danvers, Peabody, and Saugus where high development pressure is expected to threaten remaining wetlands; and
- North Andover, North Reading, and Wilmington (where damages are already occurring) which have extensive wetlands and are subject to high development pressure.

Protection of wetlands and flood plains is also expected to help existing structural flood protection projects do their job by keeping flood flows to within the design capacity of the existing dams, channels, etc.

The reconnaissance damage survey conducted throughout the basin by the Corps of Engineers produced only a single riverine area that is economically feasible to protect by structural measures at this time: the industrial area located upstream of the Main Street bridge in Wilmington. To reduce recurring damages in this area, the recommendation is:

8. **Investigate a diversion channel in Wilmington. Local officials should request the Corps of Engineers to investigate the possibility of constructing a diversion channel and dike in Wilmington.**

Cost of construction would be approximately $100,000; the flood state could be reduced nearly 2 feet below a recurrence of the flood of March 1968. Authority would be provided through Section 205 of the 1948 Flood Control Act as amended. Such a project should be closely coordinated with the proposed comprehensive program for the Ipswich River (recommendation number 2).

In built-up and heavily used areas, alternative locations outside the flood plain may not be feasible.

9. **Locate in existing safe buildings in the flood plain. Where location outside the flood plain is not feasible, municipalities should encourage private interests to locate in existing safe buildings in the flood plain, rather than permitting new construction in the flood plain.**

Floodproofing, especially of existing building, is particularly appropriate where only moderate flooding is expected, where other types of flood protection are not feasible, or where activities on waterfront location need some degree of protection. Improved and expanded storm and flood forecasting and warning services, recommended in *Chapter 8 of the Regional Report,* will also be important in keeping down future damage costs.

The *Regional Report, Chapter 8,* recommended including critical coastal erosion areas in 100-year coastal flood prone areas, and including this entire coastal flooding zone under the jurisdiction of the state coastal zone management program.

On a local level, recommendation #3 called for prohibiting development and other damaging uses of critical erosion areas through local flood plain zoning. In addition, municipalities should:

10. **Encourage natural stabilization of coastal erosion areas. Municipalities and conservation commissions should continue to encourage stabilization of coastal erosion areas, giving priority to areas eroding at a critical rate (3 feet or more per year).**

Use of vegetative cover, snow fences, discarded Christmas trees, and boardwalks have proved effective approaches to control accelerating rates of wind and wave erosion. The key is in eliminating unnatural and accelerating rates of erosion.

No specific sites have been identified for structural erosion control projects in this planning area. However, *Chapter 8 of the Regional Report* recommends selective construction of erosion control projects for areas other than beaches such as eroding bluffs (except for unique natural sites). Artificial beach nourishment does not provide substantial benefits unless public recreational benefits are added as well. Therefore, further discussion of the possibilities for beach nourishment are included in *Chapter 6 of this report.* Any studies and projects should address the littoral drift relationships between beach erosion and headland protection.

Implications

This approach is a good deal more restrictive than the National Flood Insurance Program requires. But it does make full recognition of resource limitations and natural functions of wetland and flood plain areas. The SENE Study has found that all new development can be accommodated in C, F, and G lands *as discussed in Chapter 3,* so that protecting A and B lands from inappropriate use need not be incompatible with a growing economy. In fact, a policy of resource protection and non-structural solutions is regarded as a significant step toward protecting the physical beauty of the region's landscape which is expected to be in the long-term interest of the SENE region.

CHAPTER 9 LOCATING KEY FACILITIES

As elsewhere in the SENE Study region, the Ipswich-North Shore planning area has its share of key facilities serving people beyond the boundaries of any one community or perhaps even the state. Sand and gravel extraction sites, power plants, and petroleum storage or refining facilities are good examples of facilities vitally needed but seldom welcomed. Each of these topics has significant regional implications and is discussed more fully in *Chapter 9 of the Regional Report.* The discussion and recommendations below relate only to Ipswich-North Shore issues.

SAND AND GRAVEL EXTRACTION

While there is probably no way of knowing the total potential yield of the numerous small sand and gravel extraction sites in the Ipswich-North Shore planning area, information does exist on the major sites. The major opportunities for developing sand and gravel mining lie in the northwestern section of the planning area in Georgetown, Rowley, Topsfield, and Boxford. The U. S. Bureau of Mines estimates a total reserve for the basin of approximately 15 million cubic yards of sand and gravel in these areas. They project that these reserves will be adequate to meet construction needs in the area until 1990.

The availability of these existing deposits for meeting demands to 1990 and, for that matter, the potential of other sites in the planning area to meet needs further into the future, is seriously threatened by competition from other more "acceptable" uses. Topsfield and Boxford, and to a lesser extent Georgetown, lie on the northernmost portion of the high development pressure area of the North Shore. Residential development in these towns is among the most rapid in the planning area. The real estate tax structure, of course, provides every incentive for residential development.

The irony, of course, is that the very development which threatens future availability of sand and gravel deposits is what makes them so valuable. In fact, whether the existing pattern of creeping suburbanization now being experienced in Topsfield, Rowley, Georgetown, and Boxford is allowed to continue, or growth is guided to those communities in the southern portion of the planning area with the municipal services required by urbanization *(Regional Report, Chapter 3),* sand and gravel deposits in the northern section of the planning area will be needed.

Were alternative sources of sand and gravel available, this competition would pose little problem. In fact, however, as explained in *Chapter 9 of the Regional Report,* alternatives do not really exist at present. Unless builders are willing to pay skyrocketing prices for imported sand and gravel or can wait until the feasibility of offshore mining is established, the existing sites in the planning area will have to be preserved as important resources.

While the Ipswich-North Shore planning area has regionally significant sand and gravel resources, the recommendations made in *Chapter 9 of the Regional Report* will be sufficient to preserve and regulate extraction on the North Shore. The recommendations provide for the Massachusetts Department of Environmental Quality Engineering to set statewide operating standards with local land use approvals, provide a permitting procedure for all extraction operations, and oversee site reclamation. Perhaps more importantly, the recommendations provide for a statewide survey of potential sand and gravel sites to provide a basis for protection of the resource for future use. Through a carefully planned program of sequential use of mineral deposit sites, adequate sand and gravel can be provided at the least environmental and economic cost to residents of the planning area.

POWER GENERATION AND POWER PLANT SITING

With its abundance of low density coastal land and cold water, the Ipswich-North Shore area, the northern sector of the region's major power demand center, would appear to be a prime target for power plant siting. At the same time, however, the area contains one of the largest and most valuable wetland networks on the East Coast. These wetlands plus other Critical Environmental Areas have important potential for meeting recreational needs. Some idea of the level of citizen opposition which might be expected from proposing a power plant in the northern portion of the planning area can be approximated by looking at the Seabrook nuclear proposal a few miles over the New Hampshire border. Construction at that site has been held up for three years by environmental protests.

The only significant proposal currently on the boards by the electrical utility industry is the addition of Salem Harbor #5, an 880 megawatt fossil baseload plant to be constructed by 1980. That proposal is in line with SENE Study policy to concentrate future generation facilities at existing sites whenever possible, and prohibiting use of either "A" or "B" land categories for power plant siting or other heavy development.

Also in keeping with this policy, the Study further recommends:

1. **Reconsider the Lynnway site for a power plant. The utility industry should consider construction of a large fossil-fueled unit 800 MW or larger at the existing Lynnway site as a possible "next location" when, and if, the load growth warrants.**

In the long-run, it is likely that the siting characteristics of the North Shore – abundance of coastland for development and water for cooling, and proximity to the demand center – will make it a prime candidate for future nuclear baseload generation facilities. *Chapter 9 of the Regional Report* details the critical steps which need to be taken to guarantee, yet minimize the effects of, future sites from a more appropriate regional point of view.

However, it should be noted that the prevalence of "A" and "B" lands – that is, lands the SENE Study strongly recommends that the Massachusetts Energy Facilities Siting Council not consider for siting because of their unsuitability for development – will substantially reduce the options along the Essex County coastline. Moreover, since the Study recommends that nuclear power be emphasized for future baseload generation, and nuclear plants cannot, under current federal safety regulations, be located in close proximity to centers of population, the area south of Gloucester is eliminated leaving only the northern section of this planning area as a potential site for post-1990 power generation.

With these rather limited options, it is clear that the electrical power recommendations in the Regional Report, recommending study and preservation of potential sites, have special applicability in this planning area.

PETROLEUM DISTRIBUTION, STORAGE, AND REFINING

While the SENE region's petroleum system is discussed in greater detail in *Chapter 9 of the Regional Report,* the Ipswich-North Shore planning area warrants special attention in the light of recent developments. The Massachusetts Port Authority (Massport) recently released an interim report identifying, in order of preference, sites of Newburyport and Nahant as potential deepwater crude oil receiving terminals. Onshore storage facility sites are also identified.

Apart from the regional implications of the report, the SENE Study's resource capability information indicates considerable development limitations at both of the onshore storage sites.

The tank farms shown in the Massport report are located in Newburyport in an industrial zone and on a landfill site in Saugus. The Newburyport tank farm site is directly above a significant ground water reserve. Heavy development on this site could seriously jeopardize use of this ground water, and nearby surface water, may drain into the upper Artichoke Reservoir, Newburyport's present water supply. If malfunction should allow oil to leak from the tank farm operation facilities, there is the chance that it might find its way into this public water supply. Field investigation would be needed to determine the precise direction of the ground water flow. In addition, the numerous small inland wetlands and brooks throughout the upper North Shore, including those in the Newburyport tank farm site compose the headwaters of the Little River, a tributary of the Parker River. Undeveloped, these areas are important for reducing flood hazards and damage costs downstream, and for maintaining high water quality in downstream estuaries.

The Saugus landfill site poses severe problems. The soft peaty soil conditions which underlie the site discourage buttressing the construction with underground pillars. The problem of removing the landfill will, as noted in the report, create problems of locating alternative landfill sites as well as problems of transporting and handling partially decomposed and highly acidic, odorous materials.

The SENE Study agrees with the fundamental concept behind the Massport investigations; that a deepwater oil terminal is preferable to steady increases in risky tanker traffic in the region's harbors. At the same time, more information on the opportunity costs of the sites identified is needed. The network of wetlands throughout the North Shore are vital breeding grounds for wildlife and provide food sources and spawning grounds for the region's valuable offshore fisheries. Of the five national coastal wildlife refuges, two of them – the Parker River and Thatcher Island Refuges – are within a few miles of the Newburyport terminal site.

For a number of reasons, including strong public opposition to the Newburyport tank farm, Massport has temporarily suspended detailed investigations of the offshore terminal site and has "shelved" the study.

Chapter 9 of the Regional Report contains important policy recommendations on petroleum demand reduction and facilities siting which apply to this planning area. With reference to specific current proposals for the Ipswich-North Shore planning area, recommendations include the following:

2. **Consider regional implications of petroleum facility siting policy. Any investigation of potential oil terminal sites should be SENE-wide or New England regionwide in scope, not limited to the North Shore of Massachusetts.**

3. **Develop better technical information on petroleum facilities siting.** The Massachusetts Coastal Zone Program should assist Massport in the further investigation of both primary and secondary impact of petroleum facilities development at both the Newburyport and Saugus sites whenever the study is reactivated. The investigation should be a part of a broader key facilities investigation by the Massachusetts Coastal Zone Program and the Energy Facilities Siting Council, undertaken in cooperation with the coastal planning programs of the other four coastal New England states.

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